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Photograph by American Colony, Jerusalem.

Construction gang at work on the new road east of Aleppo.

THE BAGDAD RAILWAY.—[See page 440.]

SCIENTIFIC AMERICAN

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

The Sherman Anti-Trust Act and the Patentee

ON April 16th, 1912, Mr. Oldfield, Chairman of the House Committee on Patents, introduced a bill, the purpose of which was to revise and amend the laws relating to patents. Twenty-six public hearings for the taking of testimony, occupying altogether fifty-two hours, were held by the Sub-Committee of the House Committee on Patents to discuss the merits and demerits of the bill. Manufacturers of patented articles from almost every city in the union, as well as prominent inventors and prominent patent attorneys testified before the committee. The discussion was limited to those clauses that provide for what have become known as the "compulsory license" and "non-enforcement of license restrictions" provisions. Out of sixty persons whose testimony or communications are reported in the hearings, only six favored these provisions. On August 8th, 1912, on the eve of adjournment of the House, the original Oldfield bill was reported back with amendments in the nature of a substitute, and with the recommendation that the substitute be passed. Congress, however, took no action upon this recommendation before adjournment. It is not unlikely, however, that when Congress reconvenes, the substitute bill will be reintroduced and an effort made to pass it. For that reason it is a matter of considerable importance to study its provisions.

The substitute Oldfield Bill provides, in phraseology, somewhat different from that of the original bill, for compulsory licenses and non-enforcement of license restrictions, essentially like the corresponding provisions of the original bill. It extends the application of compulsory licenses to an earlier date in the life of the patent, and exempts "original inventors" under certain conditions from compulsory licenses. In addition, the substitute bill contains a number of provisions extending the application of the Sherman Anti-Trust Act, wherever patents are involved, to specific transactions that are not now covered by the Sherman Anti-Trust Act, and which, if no patents were involved would, under the existing law, or even under the substitute Oldfield Bill (if passed) lie outside the prohibition of the Sherman Anti-Trust Act. This extension of the Sherman Anti-Trust Act, by which specific transactions, now lawful, would become *ipso facto* violations of the Sherman Anti-Trust Act in case they involved patents, but would remain lawful in case they did not involve patents, was not present in the original bill. It was not discussed or suggested by anyone upon the hearings and was not foreshadowed by any patent legislation previously proposed in either branch of Congress.

The scheme for the extension of the Sherman Anti-Trust Act resembles that of the proposed amendments to the Sherman Anti-Trust Act introduced earlier in the session by Senator La Follette and Representative Lenroot, except that their proposed amendments to the Sherman Anti-Trust Act avowedly applied to all articles of commerce, patented as well as unpatented. The Oldfield substitute bill, however, by excluding from its provisions all the transactions involving unpatented articles and limiting its application exclusively to patented articles, discriminates drastically against patented articles and grossly in favor of unpatented articles.

Thus, when the vendor of any patented article attempts to restrict the price at which that article may be sold, he violates the Oldfield extension of the Sherman Anti-Trust Act. So, too, if he attempts to restrain a customer from buying or using an article obtained from somebody else, whether such attempts be made by agreement against the purchase, or by a condition of sale against the purchase, or by a restriction upon the use of the patented article sold, or by making in the price of the patented article any discrimination based upon whether the customer buys the article from somebody else, the Oldfield Bill is violated. If the vendor of any patented article, with a view to preventing competition with that article, acquires any other patent or license, he again infringes the proposed law. When the vendor of any patented article, with a view to restraining competition, makes in the price of the patented article any discrimination (other than the ordinary wholesale discount) based upon whether the customer buys from him goods of a particular quantity or aggregate price, he is to be punished as the Oldfield law prescribes. He is forbidden from attempting to restrain competition, either by refusing to supply somebody or by consenting to supply anybody only upon terms or conditions less favorable than are accorded to anybody else. He may not attempt to restrain competition by supplying to somebody in any particular territory patented articles upon terms or conditions more favorable than are accorded to other customers. Nor may he attempt to restrain competition by making any arrangement under which he shall not sell his patented article to certain classes of persons or to those doing business in certain territories.

No one who deals in any patented article may do business under any name other than his own or that of his firm or corporation; no one may "misrepresent" the ownership or control of his business, or of the identity of the producer or vendor of any patented article sold. The vendor of any patented article must not attempt to prevent competition, by supplying the article at a price at or below the cost of production and distribution. He must not secure information concerning his competitors' business through bribery of an employee of his competitor or of any Government official or by any illegal means. He may not fix an unreasonably high price upon some material not subject to a patent, which he controls and which is required for producing a competitive article. He must not attempt to restrain competition by use of any unfair or oppressive means of competition.

Whenever a combination, in violation of the Sherman Anti-Trust Act, is shown to control any patented article, "reasonably required" in manufacture, production, general consumption or use, and "no adequate opportunity exists to immediately substitute another article therefor of real utility" the court shall compel the patent owners to supply the patented article until some other adequate substitute can be provided, upon payment of either "a reasonable compensation to be fixed by the court" or an amount of compensation payable according to any valid contracts then existing. Final judgment in a civil proceeding that a defendant has violated the Sherman Anti-Trust Act by the use of any patent in any manner prohibited by the act shall constitute, as against that defendant, conclusive evidence of the facts and as to the same issues of law in favor of any other party in any other proceeding involving the Sherman Anti-Trust Act. Whenever a defendant has been adjudged in a civil proceeding to have violated the Sherman Anti-Trust Act, by the use of any patent in any manner prohibited by the act, anybody claiming to have been injured by his conduct may intervene within three years thereafter, and be admitted as a party to the suit, and shall have judgment for the damages resulting from such injuries in exactly the same manner and extent as if he had begun an independent suit to recover damages. When a combination has used any patent in any manner prohibited by the Act and has been adjudged to have violated the Sherman Anti-Trust Act, the court may partition its severalty among groups of stockholders or sell it in parcels as a whole and forbid former stockholders to buy at the sales. Whenever it appears in a civil suit by the Federal Government under the Sherman Anti-Trust Act that a patent has been used in any manner prohibited by the Oldfield Bill, any person or estate threatened with injury may at any time intervene as a party. Whenever it is alleged in an action by the Federal Government under the Sherman Anti-Trust Act that a patent has been used in a prohibited manner, no department or official of the United States shall contract to buy anything from the defendant or its subsidiaries until the allegation "be found on final decree to be unfounded" unless no substitute of equal utility and at a reasonable price can be found.

What becomes of the exclusive privileges granted to the inventor by the Constitution of the United States? What is the good of a patent at all if this bill is to become a law? What inducement is there to any inventor to spend years, and possibly thousands of dollars in perfecting an invention that may make food cheaper, transatlantic travel safer, or aeroplanes automatically stable? Why not abolish the patent laws entirely and thus prevent the inventor or his assignee from enjoying the fruits of his ingenuity and labor in the manner contemplated by the Constitution? That would at least be legal and constitutional, which the substitute Oldfield Bill is not. But it would also be just as ridiculous.

Longer Ships—Longer Piers

THE application of the German steamship companies for permission temporarily to extend their piers at Hoboken in order to accommodate their larger steamships, and notably the "Imperator," which is due here in May of next year, has been rejected by Secretary of War Stimson. The action of the Secretary is an indorsement of the opinion of the army engineers, who believe that any further extension of the piers, even of a temporary character, into the fairway of the North River would be detrimental to the interests of the port of New York. To the army engineers is intrusted the guardianship of the rivers and harbors of the country, and it is their duty to see that no encroachment is made by private or corporate interests on the anchorages, channels, or fairways of the country by such interests at the expense of shipping in general. Although the channel at New York between the Manhattan and Jersey shores has a clear width between pierhead lines of about half a mile, the army engineers believe that this is none too much to accommodate the present traffic, to say nothing of its probable large increase in the future.

If the War Department is to have its way in this matter—which is not by any means certain—the question of making provision for these big ships becomes very pressing. It is futile to protest against their ever-increasing dimensions; for their growth is due to a fixed economic law, well understood in the field of transportation; and that the sun will rise to-morrow is scarcely more sure than that the one-thousand-foot ship, within a few years, will be afloat upon the high seas. Furthermore, their port of call in the western hemisphere will be somewhere on the Atlantic seaboard of the United States, and it can be safely predicted that the port will be New York. Where, then, shall these huge vessels be accommodated? Boston and New London are out of the question; and the terminus at Montauk must ever, for economic reasons, remain a mere dream. Passengers will never consent to a change from the spacious comfort of an ocean liner to the comparatively cramped quarters of a Pullman car, merely for the sake of taking a two-hour ride through Long Island into New York. They will always ask to be carried to the city itself and as near to its heart as is possible. For this reason the proposal to berth the steamships at South Brooklyn will be always unpopular. It begins to look as though a new steamship center would have to be formed further up the Hudson River, and piers of 1,000 feet length or over constructed by excavating, if indeed this should prove to be necessary, at their shoreward end, in order to secure the desired length.

The SCIENTIFIC AMERICAN, however, is still of the opinion that the requested extension of the piers should be granted, and this for the reason that the width of the channel at New York is far greater than that of any other of the leading ports of the world. If the War Department should allow an extension on each side of the river sufficient to accommodate ships one thousand feet in length and then establish a pierhead line which should be irrevocable, there would still remain a fairway several hundred feet wider than that of any other seaport of the first rank.

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Science

A Seismological Observatory is to be built at Victoria, British Columbia. The Dominion government has appropriated $2,000 for this purpose.

Mountain Weather Station in Argentina.—The Argentine government has established a meteorological station at San Esteban, Province of Cordoba, at an altitude of 4,000 feet.

A New German University is to be established at Frankfort on the Main. A number of existing educational and scientific institutions, including the local medical schools and the Physikalischer Verein, will be absorbed by the university, which will be further built up by various donations and foundations. About $1,730,000 is already available.

How to Bleach Ivory.—To bleach ivory ornaments or piano keys the following method works well. The ornaments are first washed or "soaked" if possible in a bath of unslaked lime, which has in it a few ounces of bran and water. This should make a pasty solution if properly mixed, and will bleach the ivory which is discolored or stained. It should be rubbed off with a cloth and the ivory dried in magnesia powder. After a few minutes a few strokes with a cloth gives the ivory a brilliant polish.

Dr. Flexner Delivers the Huxley Lecture.—The annual Huxley Lecture to the Faculty and students of Charing Cross Hospital was delivered this year by Prof. Simon Flexner of the Rockefeller Institute of New York. The subject was "Some Problems in Infection and Its Control." Not for many years has so great an interest been taken in the Huxley Lecture. Long before the hour fixed for the proceedings to begin in the theater of the hospital, every available inch of space had been taken by as distinguished a medical audience as ever attended this important event.

New Instrument for Analyzing Gases.—By the use of a new German instrument, which takes the index of refraction of mixed gases, Haber and Löwe are able to find the amount of carbon dioxide and methane contained in mine gases. The method is also useful in many other cases such as for benzol vapors in the gas distilled by gas or coke plants, also sulphurous anhydride in the gases coming from pyrites roasting, as well as percentages of ozone in the air. They are also able to check the purity of hydrogen made by the electrolytic process, observe the gases in human breath and carry out other very useful tests. Recently O. Mohr applied the method to analyzing the products of combustion of furnaces so as to have a useful check upon the way the fuel is being burned.

Borrelly's Comet.—A telegram received at Harvard from Prof. A. O. Leuschner, of Berkeley, Cal., gives the following elements and ephemeris of Borrelly's Comet, computed by Nicholson and Lansendorf from observations on November 3, 4 and 5:

ELEMENTS.

Time of perihelion passage (T)	1912, Oct. 20.53 G.M.T.	
Perihelion minus node	(ω)	98° 52′
Longitude of node	(Ω)	143° 18′
Inclination	(i)	124° 52′
Perihelion distance	(q)	1.105

EPHEMERIS.

G.M.T.		R.A. h.	m.	s.	Dec. °	′	Light.
1912 November	8.5	18	32	13	+28	51	0.88
	12.5	18	53	56	+22	54	
	16.5	19	11	36	+17	38	
	20.5	19	26	18	+13	04	0.51

Amundsen's North Polar Expedition is now assured, thanks to the liberality of Pedro Christofferson, a rich Norwegian living at Buenos Aires, whose financial aid also made possible the journey which resulted in the discovery of the South Pole. The explorer returned to his home in Norway the 1st of August, where he has been putting the last touches to the report of his recent journey, delivering lectures, and hastening preparations for his forthcoming drift across the north polar basin. His ship, the "Fram," which he left at Buenos Aires, was expected to sail in October for San Francisco, to complete fitting out, and the start from that port for Bering Sea is planned for June, 1913. Amundsen will push as far north as possible before engaging his vessel in the ice, with which she is expected to drift still farther north, and thus pass closer to the pole than did De Long, with the "Jeannette," or Nansen, with the "Fram." However, no special effort will be made to reach the pole. The object of the expedition is to make a thorough exploration of the polar sea, including its currents, depths, the character of the bottom, and the meteorological conditions. The explorer hopes to drift from north of Bering Strait to the eastward of Greenland in three years, but the expedition will be provisioned for at least five years. It is just possible that the Norwegian party will encounter the American Crocker Land expedition which is to proceed westward over the ice from Grant Land next year, and that one or both of these parties will fully explore the land which Peary saw far to the westward during his march to the pole.

Aeronautics

Appeal for Military Aviation in England.—Owing to the success which the public subscriptions are having in France for the purchase of aeroplanes for the army and the poor results coming from a like subscription opened in England for two months past, Major Gen. Arbuthnot, who is president of the British Aerial League, has addressed a new appeal to patriotic sentiment in favor of military aviation in England.

From London to India.—The well-known English aviator Cody is making plans to take part in the flight from London to India. This event has lately been organized and is likely to be of great interest on account of the unusual length of the trip. Several important prizes are to be awarded for the flights. However, the organizers are likely to postpone the event for some time, owing to the fact that the original path lay across the Balkans.

Monument to Latham.—After Blériot, who has a monument erected near Calais to commemorate his cross-Channel flight, Hubert Latham is now to have a monument as well. This will be located on the heights of the Sangatte cliffs at the point where he started on his flight. A group of sportsmen are organizing a subscription for this purpose, so as to commemorate the two attempts to cross the Channel, in one of which he practically succeeded, as it will be remembered that he came very near landing on the English coast. Latham was the first aviator to have the idea of crossing the Channel, which was considered a very bold attempt at the time. We may also mention that a committee has been organized to erect a monument to aviation pioneers, and especially to Wilbur Wright, at the Auvours camp.

Stabilizing Parachutes for Aeroplanes.—Trials of a new stabilizing parachute for aeroplanes were made recently at the Eiffel Tower by the inventor, Triaire. On this occasion the apparatus was a reduced model of one-quarter size and had been ballasted with lead, the total weight being 160 pounds. The aeroplane is of the monoplane type, and provided with the new device it was raised by cable to the first platform of the tower. After being placed in the most unfavorable position as regards capsizing, the aeroplane was dropped, but it was able to right itself after a rapid fall of some 30 feet, and then landed on the ground without any damage. It was noticed that when the aeroplane, which had about a 10-foot spread, was let fall, a strong wind overturned it on one side, but the stabilizer acted at once to restore the machine, and it alighted slowly at the base of the tower. This is the second trial which the inventor has now made with his device, and its success appears to be so clearly shown that he proposes to apply an apparatus upon a full-sized aeroplane and will pilot it himself in order to give a convincing demonstration.

Aviation in French West Africa is discussed in *La Technique Aéronautique* by a superior officer of the French colonial infantry. Many pessimistic statements have been published regarding the difficulties of aviation in the Sahara and adjacent tropical countries—warping of wooden frames, clogging of the motors with sand, rapid evaporation of gasoline, difficult country for landing, and what-not. Hence it is highly gratifying to learn from an authoritative source that all of these statements are erroneous, and that actual experience has proved aviation to be, on the whole, neither more difficult nor more dangerous in the heart of Africa than in the heart of France. Military aviators have made many long flights in the region in question; one of them covering about 350 miles. In Senegal it is found that the sand borne by the winds does not extend more than two or three hundred yards above the ground. It is evident that the new arm of the military service will greatly facilitate the administration of these colonial possessions. The nomadic natives still indulge in frequent raids, which will probably be entirely suppressed by the combined efforts of the aviators and the *méharistes* (troopers mounted on swift camels).

Hydro-aeroplanes in Europe.—Experiments with new hydro-aeroplanes are being actively carried on in different parts of Europe at present, and we may mention the tests which Beaumont made upon the Seine near Paris with a Donnet-Leveque 80 horse-power machine, taking on board Mr. Lowe, an engineer representing the English Vickers establishment. Then the machine was taken apart and shipped to England, where Beaumont is to put it through the official tests required by the Admiralty. On the same day, Kuhling made flights with a 50 horse-power Donnet-Leveque machine, while Mr. Lowe piloted a third machine, also of 50 horse-power. In the Mediterranean, the Paulhan training school at Golfe Juan is a leading center. Lieuts. Garnesini and Roberti are making flights of long duration and show great skill in alighting on the water, flying around the battleship "Condorcet" which is anchored in the bay, and making evolutions above Cannes. Chief pilot Mollieu is trying out a machine which is ordered for Italy. In Switzerland, Burri, mounted on a Sommer hydro-aeroplane, closed the events on Lake Leman by a flight over the lake from Geneva to Evian, accompanied by Com. Dolfus.

Automobile

A Wind Shield for Motor Cycle.—The patent, No. 1,042,305, to Chauncey M. Wright of Philadelphia, presents a wind shield in which the shield member is clamped to the handle bars of a vehicle and springs are arranged between the portions of the shield member and the clamps, thus cushioning the connection with the vehicle.

How to Clean Spark Plugs.—A good way to clean spark plugs or any mica substance is to first wash in a 10 per cent solution of acetic acid, which cuts grease and carbon deposits. This should be washed off by gasoline and then the plug dried by rubbing with a cloth or waste shreds. This works exceptionally well on all mica substances, but is good for removing carbon deposits from other articles.

Driving Out the Horse-car in Wurtemburg.—The government of Wurtemburg, Germany, is taking steps to substitute autobus lines for all the horse traction lines existing in the country, and it is now engaged in drawing up the plans for the project. The department has already entered into connection with the leading German automobile constructors in order to secure their co-operation in the enterprise, and bids will no doubt be called for in the near future. At present the department has not made any definite decision in the matter.

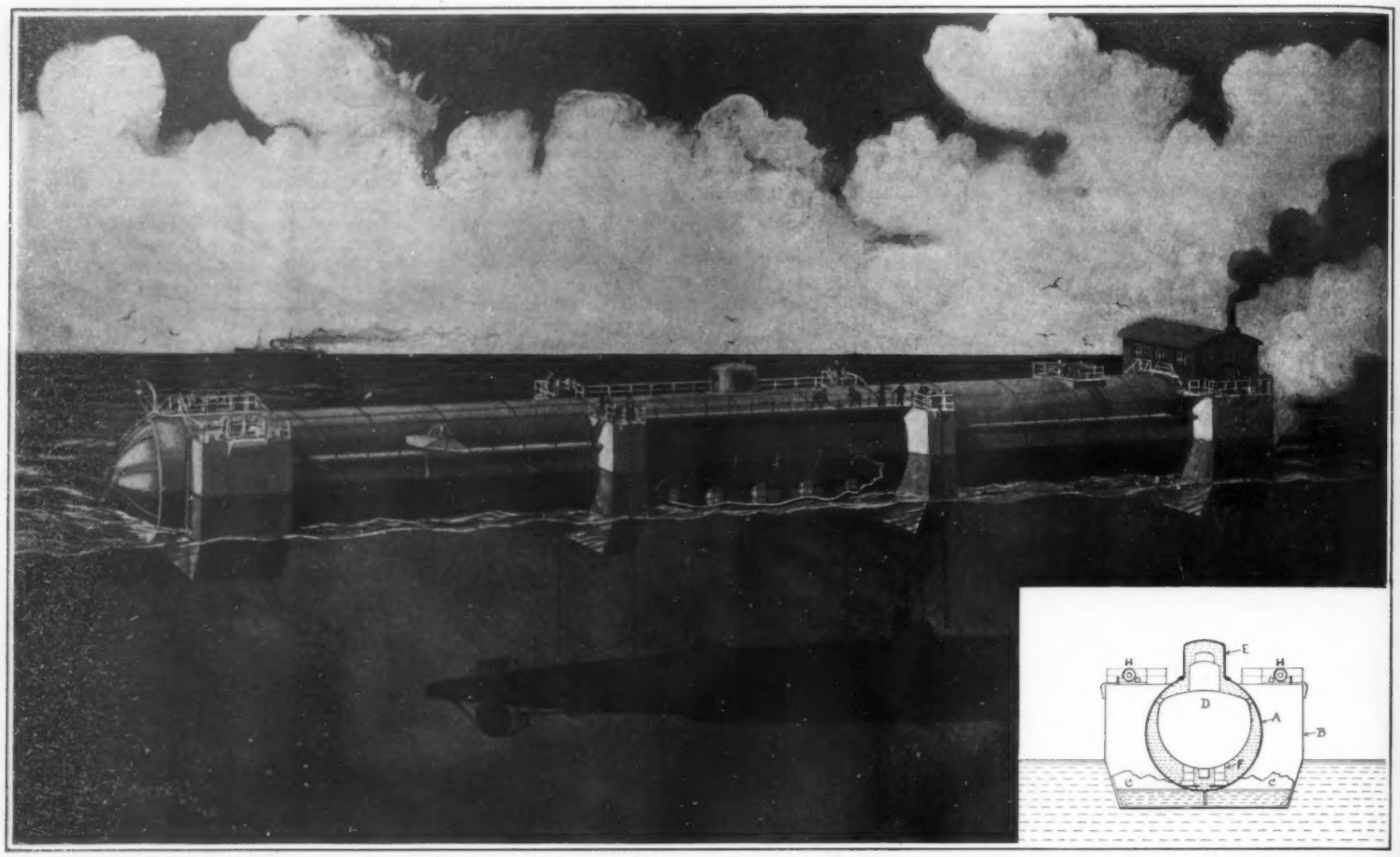
Car for Transporting Automobiles.—The Orleans Railroad Company of France is now using a well-designed car for carrying automobiles where the latter are packed in closed boxes. The new car is about 22 feet long and 8 feet in width with a somewhat greater height, and owing to the roomy space which it affords it is able to carry the largest automobiles. These are loaded into the end of the car, which is fitted with two folding doors and a flap which is let down so as to make a platform flush with the car floor. Side doors in the car also give access for carrying out operations. A set of cleats on the floor and also solid straps at the sides, allow of fixing the automobile body in the best manner to avoid all shifting on the road.

A **Hospital on Wheels.**—The new French Schneider ambulance is a veritable portable hospital, being a truck of probably the largest size yet constructed and having an operating room in the middle part, with two smaller rooms at the ends. It contains an electric plant which is used for lighting, water pumping and sterilizing and for surgical motors. Water is pumped in by hose from a well or pond, and after passing through the ultra-violet ray sterilizer it is stored in a tank. When the ambulance is brought to the spot, for instance on a battlefield, a wing in the shape of a tent is formed by a tarpaulin on each side of the wagon, and the two tents are electrically lighted through windows in the sides of the car.

A Refrigerator Motor-truck.—A 35 horse-power truck of the De Dion type is in use at Buenos Aires for transporting meat, and it is designed as a refrigerator car on the most approved principles. The present car has a body of unusually large size and height and weighs 5 tons. In the same connection we may mention a De Dion car for ice delivery which is now in circulation at Havana. It has a 24 horse-power motor and the total weight is 3.3 tons. The same establishment is building a number of cars of automobile-ambulance type for transporting the wounded. These are comparatively light and rapid. One of them is in use by the city of Mullhausen (Alsace) and a second has been supplied to the relief committee of Havre.

Transport for Race Horses.—Among the new French power wagons built for special uses we note the truck which was delivered to Mr. Gould at Paris and serves for transporting race horses. It is a roomy van with the driver's seat in front and carries a 30 horse-power motor. Built according to the Latil system, the front truck is motor driven and forms a unit with the motor and mechanism, leaving the rear axle free. A handsome car of about the same design was also built for Mr. Vanderbilt. Another Latil car is mounted as a street sprinkler and sweeper and is used by the municipal department of Paris. A large truck of the same type is built for transporting aeroplanes. The van can be tilted down to the ground level in the rear so as to unload the aeroplane by sliding it down ways

Four-wheel Drive.—The new Panhard power wagon has an original feature in that all four wheels are driven as well as steered, all the wheels being operated by a single differential. At Satory, near Versailles, a tractor of this kind was driven up a bank 14 inches high and over a log 16 inches in diameter. Using the first speed or 2 miles an hour, it could run up a bad piece of chalky road containing ruts and having a 28 per cent grade. The maximum speed was 10 miles an hour. With a trailer weighing 6.5 tons it could mount a 9 per cent grade using the first speed (accelerated), and with the second speed, or 4.5 miles an hour, it climbed a 4 per cent slope. The same slopes could be climbed in first and second speeds with a pair of 5-ton tractors serving as trailer load and representing a total of 10 tons drawn by the power wagon. The truck has a 6-cylinder 35 horse-power motor. A drum on the car allows of cable hauling at a speed of 1.2 miles an hour and a pull of 4 tons.



Length over all	235 feet	Displacement light	500 tons
Length available inside	213 feet	Displacement loaded	925 tons
Internal diameter of pressure tube	23 feet		

A, pressure tube; *B*, caissons; *C*, water ballast; *D*, submarine; *E*, pressure hood for conning tower; *F*, keel blocks; *H*, electric winches.

Italian salvage vessel and testing dock for submarines.

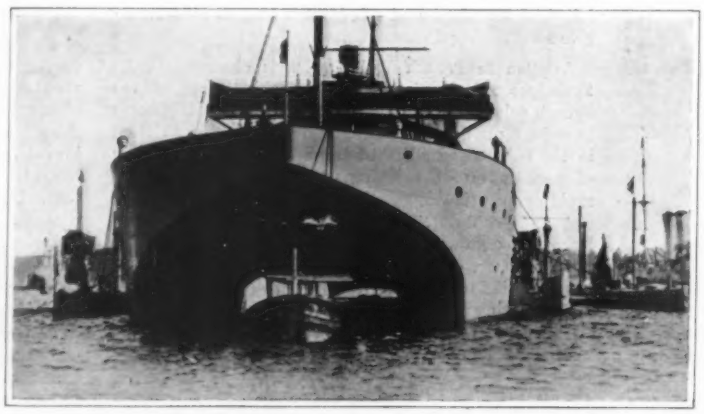
Salvage and Testing Facilities for Submarines

By R. G. Skerrett

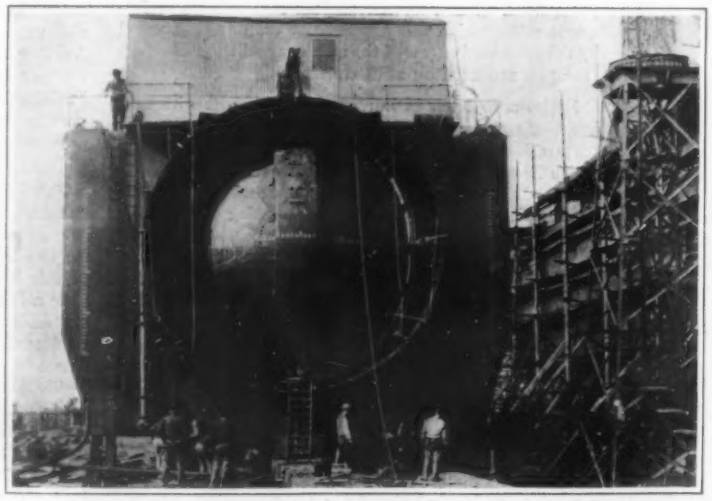
THE difficulties encountered in raising the sunken British submarine "A3" have in them a note of warning for us. We are steadily adding to our flotilla of under-water craft, and yet we have no proper facilities in the Government service for the prompt salvage of any of these boats should they be carried suddenly to the bottom. We have been fortunate so far in escaping serious accidents, but that is no reason for assuming that we are any more likely to be immune from disaster than any other naval service. We should profit by the catastrophes which have befallen England, Russia, France, Germany, and Japan, and no longer continue unprepared for kindred mishaps.

Public opinion, revolting at the inaction of the Ministry of Marine and reaching a climax of indignation at the delay in raising the unfortunate "Pluviose," forced the French authorities to undertake the construction of a salvage vessel especially adapted to deal with sunken submarines. The accompanying illustration shows the boat provided by the French government late last year. The Germans anticipated the French in this particular, and their special salvage craft, the "Vulkan," proved useful when the "U3" sank in the Baltic more than a year ago. England is slowly equipping herself with the same character of vessel, but the difficulties that have attended the raising of her several submarines that have gone to the bottom have shown the insufficiency of the apparatus at present at her disposal.

It is not pleasant to think that men may be carried to the bottom in under-water boats under circumstances which make it possible for them to survive in their confinement for many long hours and yet, in the end, die because the salvage equipment is inadequate to cope with their relatively speedy raising. This has happened abroad, upon several occasions,



The German salvage vessel "Vulkan." Can lift 500 tons 25 meters in an hour.



The testing dock before launching, showing the caisson or globular stopper in place.

under harrowing conditions, and it may occur here if some provision is not promptly made to prepare for just such an emergency. It is not fair to the men that take the risks necessarily involved in service aboard submarines to hesitate longer in building the required salvage apparatus.

There are some kind of accidents which may send a submarine to her doom and against which no foresight can provide; but, again, there are other circumstances which may cause a submarine to sink and which may be either entirely eliminated or largely minimized by prevision. To a large extent, this anticipation of accident lies in making the submarine strong enough to resist the stresses of deep submergence and in equipping the boat with pumps and other tried means for the expulsion of water ballast or for the neutralizing of reasonable leaks at those depths. It will be asserted authoritatively that we are now taking these very steps, and it is a matter of common knowledge that our submarines, before their final acceptance by the Government, are actually subjected to a submergence test which requires the boats to be sunk, without anyone aboard, to a depth of 200 feet. The inspiration for these trials was an accident to one of our own submarines of the first group built, which, when 125 feet down—she was carried there by leaky valves—leaked so menacingly that she was brought by her crew to the surface again only through the desperate working of a single hand-pump. It was a very close shave for her people, but it taught the Government a salutary lesson.

But there are circumstances incident to the present method of subjecting the hulls of our submarines to test which are far from ideal, and they do not give a true index of all the conditions which bear importantly not only upon the future safety of the submarine in service, but

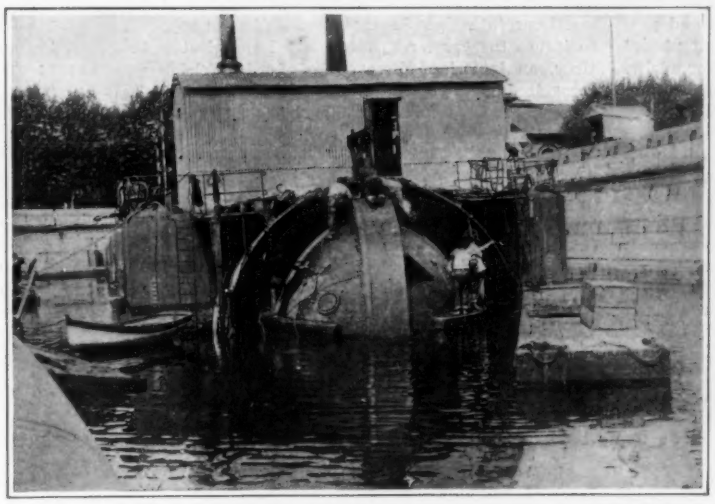
which are vital in guiding the designer toward improvement. Our inspectors examine the submarine *after* she returns to the surface, and they have imperfect means of telling just what has been going on within the craft at each stage of her submergence and her ascent. The instruments employed do record the amount of yielding or deformation of the hull at the particular points where these registering apparatus are placed, but there is much besides this data which is well worth the knowing, and which cannot be ascertained in this way. It would be valuable to know if the pumps in the boat would work efficiently against the head of water 200 feet below the surface; it would also be of importance to learn whether or not the air system could expel water ballast at that depth, and, if so, whether the tank walls would be able to stand up against the contending strains; and, likewise, whether all of the sea connections and associate valves could be relied upon under such conditions. This data is virtually a matter of assumption as the tests are now conducted. Apart from this, it is not always convenient to take a submarine to an off-shore position where a depth of 200 feet of water can be assured; and the present facilities for sinking her and raising her are fairly crude, and can be put into service only when weather conditions are favorable.

The special salvage vessels already built in Germany and France and under construction in England can help in carrying out test submergences of submarines, and do, in fact, provide more flexible facilities for this operation than the ordinary wrecking derrick and lighter which we utilize, but it is still necessary that the submarine be carried to deep water for the purpose, and deep water is not always conveniently available. Perhaps the inspectors would be more willing to go down in the submarine undergoing test if the boat were attached to one of these special salvage craft, but this is a matter of speculation. At present, we have no salvage vessel of this sort, and, even if we had, it would not be the best solution of the problem as it has developed with the growth and the wider service now exacted of under-water torpedo boats. It is to Italy that we must turn for the most startling development of a submarine auxiliary, a structure which combines the virtues of a special salvage craft with a testing dock of a novel and extremely valuable character.

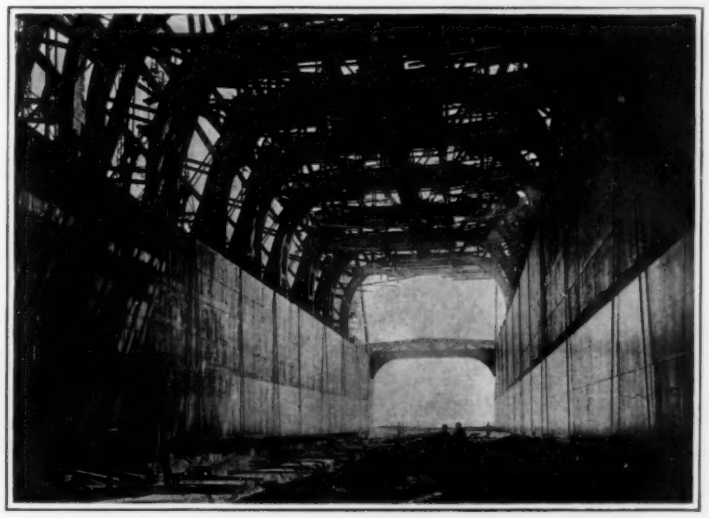
There has recently been launched at Spezia, Italy, for the Italian navy, a craft of this dual character, which is far ahead of any other equipment yet provided by the various maritime powers having flotillas of submarine boats. The Laurenti testing dock, designed by Major Cesare Laurenti, technical director of the Fiat-San Giorgio, puts the submergence trials of a submarine upon a thoroughly safe and practical line of procedure, and, at the same time, makes it possible to obtain at first hand data of the utmost importance not only regarding the physical possibilities of the particular submarine undergoing examination, but also information which will point surely to the way to make improvements.

We must not forget that the dual service required of a submarine on the surface and under water demands a form of hull which must, of necessity, be a compromise. The spindle shape is best for submerged speed, while the ship form lends itself better to surface conditions and rapid propulsion on the water. The circular cross-section of the spindle is the simplest and the least expensive unit of strength, while the elliptical or ship-shaped section is naturally weaker and harder and more costly to build for any unit of great strength submerged. Each change of form, therefore, demanded by military requirements introduces a new factor of uncertainty, and the real strength of any cross-section can be determined best by actual construction and a pressure test. The Laurenti dock makes it possible to get this information at a modest outlay and to try experimental sections without the building of an entire submarine. This is an advantage of incalculable value, and the beauty of the scheme is that the work can be done at the shipyard and in shallow water.

Bow view of French salvage vessel for submarines.

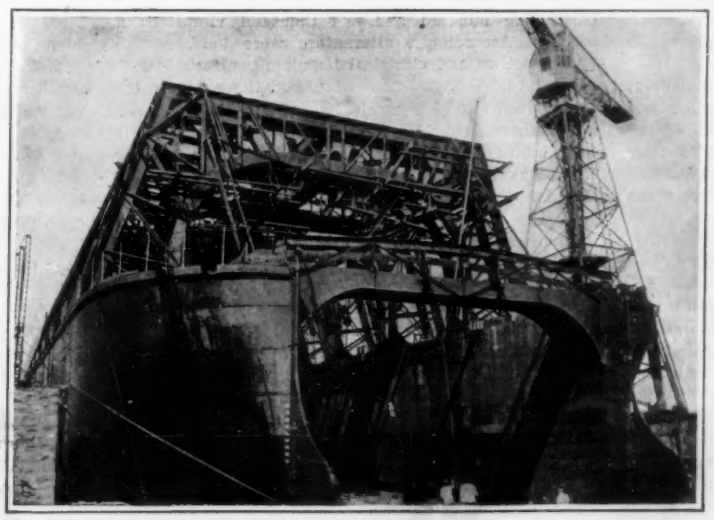


The testing dock in a drydock with the workmen engaged in withdrawing the caisson.



French salvage vessel.

Displacement, 2,300 tons; length, 322 feet. Can lift 1,000 tons from a depth of 120 feet.



Stern of French salvage vessel, showing catamaran arrangement of the two hulls.

Free space between hulls, 41 feet 9 inches.

The Laurenti equipment consists fundamentally of a long steel tube *A*, capable of withstanding high pressures exerted from within, into which a submarine *D* can be floated and secured, after which the entrance is hermetically sealed. In our picture, the gateway is shown on the left sealed by the convex caisson. The pressure tube is supported by ballast tanks *B*, which can be filled with water ballast *C* or exhausted as occasion requires. The dock has its own power plant and its own pumping equipment. A removable hood *E* provides a housing for the conning tower. The tube is supplied with keel blocks *F*, and electrically-driven capstans *H H*. When the submarine is held within the dock and surrounded by water filling the tube, as shown by the small diagram, pressure is exerted upon the enveloping water by a suitable steam pump, and this pressure can be raised greatly in excess of the hydrostatic pressure to which a submarine would be likely to be subjected voluntarily. Observers remain in the submarine while undergoing this pressure trial, and telephonic facilities keep them in touch with those in charge of the dock and the pumping plant. In this way, the inspection can be carried on deliberately and exhaustively, and all of the operative mechanisms can be put in motion and tried under physical conditions truly reproducing the circumstances of actual deep submergence. There is no hazard involved, and the whole operation can be conducted right at the building yard.

Our illustration also shows how the Laurenti dock can be used as a salvage apparatus. In this manner a sunken submarine can be raised and carried into port or borne to shallow water, where she can be opened and entered if such an operation be desirable. In addition to being a testing dock, the Laurenti submarine auxiliary can also be employed as an ordinary floating dock for under-water boats, and in our picture the plating is removed amidships to show a submarine resting inside upon the keel blocks.

Nothing else designed up to date can be compared with Major Laurenti's invention, either in its practical advantages in meeting the varied possible requirements of submarines already built or in providing a guide for future development. The dock in question is long enough to accommodate a submarine of 200 feet in length and has a displacement of 500 metric tons when light. The dock's maximum displacement is 925 tons, at which time, with a large submarine inside, the structure draws only 10 feet of water.

Progress of a South American City

PROBABLY there are educated people in the United States of North America who have never heard of Sao Paulo. This Brazilian town, the capital of the great coffee-growing State of the same name, now has an estimated population of 380,000; and it is anticipated that within 15 years it will reach the million mark. Although 4,000 new houses were erected in the city during the past year, the demand for houses greatly exceeds the supply, owing to the rapid increase of population, and rents are exorbitant. A magnificent opera house, constructed by the municipality, was opened last year with a brilliant season of Italian opera. The old cathedral is to be torn down to give place to a new one, which will cost $2,000,000, and will be one of the notable churches of the world. Finally, a vast scheme of city improvements has been inaugurated, under the advice of M. Bonvard, architect for the city of Paris. It will include splendid boulevards and viaducts, asphalted streets, and a public garden, at an estimated total cost of $20,000,000, toward which the State government has already appropriated $3,500,000.

Flying-Boat Races

By Glenn H. Curtiss

IT is not difficult to understand why a sheet of water affords an ideal aerodrome. In the first place, the aviator does not have to run along a given course to start, and he can always head into the wind. Then again, in landing, he does not have to be so particular, because the surface of the water is sure to be level; whereas from an altitude, a field which looks level may turn out to be quite impracticable as a landing place. Another advantage of water flying is that the wind is much steadier over the water. Altogether, it is much easier and safer to start and alight on the water than on the ordinary flying ground. In addition to this, if as a result of careless landing and the inexperience of the operator, an accident does happen, it is not likely to be serious.

The hydro-aeroplanes gave us all these advantages in water flying; but the new "flying boat" gives us, in addition, the advantages to be found in a boat with its large surplus of buoyancy, seaworthiness and protection for the aviators. The new Curtiss "flying boat" will ride as rough a sea, either under power or adrift, as any motor boat of its size, and flies as well as any aeroplane of equal proportions; so that the combination gives us the advantages of the motor boat and the aeroplane combined, and there are no limitations to the development of this type of machine.

The many fatal accidents to exhibition fliers, using land machines, has directed the attention of all interested in aviation to the flying boat. This machine offers a means by which aviation may be enjoyed as a sport and developed and advanced as a science, without the dangers which heretofore accompanied flight.

The "flying boat," shown in the illustration, has a hull 25 feet long by 2½ feet beam; carries 250 square feet of plane surface, and an 80 horse-power water-cooled motor with a propeller attached direct to the engine shaft. It has a carrying capacity of 600 pounds, and will carry fuel supply for a flight of 400 miles. It is fitted with dual control, so that either the operator or passenger, who sit side by side, may assume full control of the machine.

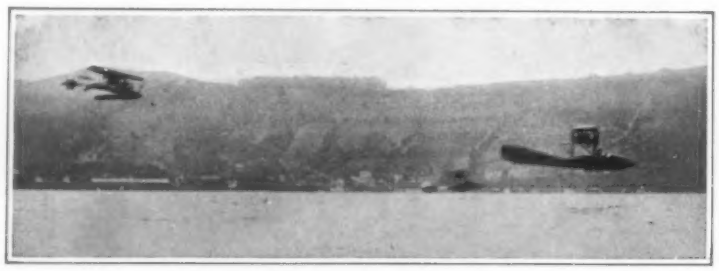
In starting from a standstill in the water, the machine, after attaining a speed of about ten miles an hour, rises to the surface, on which it travels as a hydroplane until it reaches a speed of 45 miles an hour relative to the wind, when it will leave the water at a slight inclination of the elevator. It maneuvers quite readily on the water at all speeds, and will turn circles of a short radius, either at high or low speed. The boat is built very strongly, as it must necessarily be, to withstand the shocks of starting and alighting in rough water.

The accompanying illustrations show two of the new flying boats and a hydro-aeroplane in the first race of the kind ever held. The race was arranged for the students and visitors at the Curtiss Aviation School at Hammondsport, on the afternoon of October 28th. All who witnessed the race are unanimous in the opinion that yachting with the flying boat is destined to be one of the greatest of sports.

The sight of three machines jockeying for position was inspiring, while the close finish of the return trip would stir the blood of any sportsman. The three machines were all fitted with the same engine power; but the flying boats proved speedier in the air and faster in making turns on the water, a rule of the contest being that the machines must round the buoy on the water, and must fly only between the starting and finishing points, excepting on the third lap, which was the finish.

Two flying boats and one standard hydro-aeroplane jockeying for position at the start of race.

Forty-five miles an hour on the water.



Finish of race. David McCullock in his flying boat leads; Lincoln Beachy is second; Francis Wildman is third.

Some Developments in Wireless—I

By John Hays Hammond, Jr.

SINCE the first conquests of space by Hertzian waves, what has been the main development in the perfection of wireless communications? It may be stated that the chief inventive energy has been concentrated on the practical problem of increasing the effective range of intercommunication and the selectivity of the individual system. In 1897, Mr. Marconi transmitted messages to a distance of 8.7 miles. To-day, Mr. Marconi says that the maximum effective distance of transmission is 6,000 miles. It is evident from a consideration of these figures that not merely a quantitative change has been made in the system of transmitting energy, but that vastly improved means of effectively utilizing this energy has been made.

In this connection it is interesting to note that Count von Arco estimates that whereas a few years ago only 50 per cent of the available energy at a station was used in radiant energy to-day, by quenching the oscillations in the primary circuit, 75 per cent of the energy is converted into useful work. This remarkable advance in power economy has been brought about chiefly through the better understanding of the conditions that would allow of more sustained electrical oscillations in the open circuits of the transmitter. The receiving stations, on the other hand, have been rendered infinitely more sensitive to the reception of weak signals by discarding the coherer principle of wave detection. The coherer, whose principle is generally understood, was discovered as early as 1879 by Prof. Hughes, and rediscovered in 1890 by Branly. This instrument was used for several years in commercial practice, but was discarded some years ago for numerous more sensitive detectors. To-day the telephone is used in conjunction with suitable detectors, and has been found to be astonishingly sensitive to small currents. Besides modifications in the apparatus to insure the greater sustainment of electrical oscillations, an important discovery of Lord Rayleigh was recognized as an essential factor in designing a wireless system. This discovery is the physiological law that the human ear allows us to hear best, sounds of between five hundred and one thousand vibrations a second. Accordingly, alternators were built of 500 cycles, a thousand electrical impulses per second were produced at the sending station, and the receiving operator heard a high musical note. In this way not only may we consider that the receiving instruments have been rendered more sensitive, but the human ear itself has been made to respond better to incoming signals.

The Problem of Selectivity.

Another important pursuit in wireless has been the development of means to secure a selective intercommunication between the sending and receiving stations. A certain amount of selectivity has been obtained on the principles of electrical tuning. Many of the requisites in economical long distance transmission resemble the requirements for accurate tuning, and in this way the theoretical development of wireless is well advanced. The chief source of trouble lies in the fact that practice does not care to keep pace with theory, and for this reason, instead of a station emitting either a pure electrical tone or an acoustic tone, it will be found that much of the apparatus in use is of prehistoric refinement. Sing a clear sustained note into an open piano and you will hear a string of the identical pitch vibrating. Sing a rapidly descending scale and you will hear several strings vibrate. The first method resembles an undampened wave of modern production, actuating a single station; the second method, the old style of dampened waves, actuating every station in the vicinity. A still graver source of interference is found in a station emitting pure waves that are undampened, but which are so powerful that they cause every nearby aerial to pulsate electrically in their own specific frequency. For the immediate present proper legislation seems to be the most practical remedy for this evil.

The pioneer leaders in the adoption and perfection of the sustained oscillation system are Reginald Fessenden in this country, and Valdemar Poulsen in Europe. These two inventors have employed, however, widely different means to obtain the same result. Poulsen has made use of the principles of Thomson s singing arc, while Fessenden has developed alternating current generators which have the remarkable ability of producing from 50,000 to 200,000 alternations of the electric current per second. Alexanderson, of the General Electric Company, designed these machines and they represent a triumph of constructive skill. The heart of the mechanism is a disk rotating at a speed of 20,000 revolutions per minute. Mr. Alexanderson says: "The diameter of the disk being one foot, the peripheral speed is 1,000 feet per second, or 700 miles an hour; in other words, the disk would roll over to Europe in 4 hours." These machines are to-day on the open market, and their general adoption will be a great factor in eliminating much of the present interference. Ernst Ruhmer, the German scientist, believes that the Fessenden method will undoubtedly be the method used in the future for the production of pure electro-magnetic waves. The limitation of the high frequency alternator, however, is due to hysterisis losses in the iron which limits their efficient outputs to long wave-lengths.

Present Success in Avoiding Interference.

The near future of wireless will see improvements following along the general lines of increased range of transmission, and better means for procuring immunity to interference. In the pursuit of selectivity, however, I believe a different course of development will be followed from the lines hitherto adopted. True immunity to extraneous interference is immunity not merely to static atmospheric charges or forced oscillation effects of powerful neighboring stations, but it must be immunity to intentional interference. This phase of interference has been already developed in the German navy, and a machine has been constructed on the principle of a siren. The operation of this machine is somewhat like singing a rapidly descending and ascending scale near a piano. All wave-lengths are momentarily emitted and a tremendous source of interference is produced. The Germans do not interfere with themselves, for they simply omit the note they use from the diapason of the siren. A spark gap placed directly in the antennæ will also produce an equal disturbance. How are we going to avoid the effect of these intelligence destroyers? By perhaps one method: the use of a system operating through the conjoint action of two or more waves of very different characteristics. Tesla shows a system in a patent granted in 1903. Each of his individual waves of different frequency closes a certain relay, and before the final indicating device operates, it is necessary that a number of relays be closed, each by a different individual wave. In order, therefore, to create an interference, it would be necessary to determine the combination of the waves used; and since the possible combinations are infinite, the general theory of the system prohibits intentional interference. The use of relays, however, prohibits the practical use of the system.

Prof. Fessenden was granted a patent in the same year on a system utilizing the same fundamental principles of co-operative waves. He, however, obtained far greater immunity to extraneous disturbances by operating the system not by the electrical frequency of his transmitting station, but by the acoustic frequency or note we have already mentioned. That is to say, a chord of musical notes is produced at a sending station and the receiving station contains only such tuned elements as will respond to this chord. With a detector having no appreciable resistance I have operated this system successfully. De Forest, Stone, Ehret and others also have patents on systems operating broadly on the principle of co-operative waves. The future selective system of wireless undoubtedly has its nucleus in this ingenious principle.

(To be continued.)

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

A New Form of Underwater Attack

To the Editor of the SCIENTIFIC AMERICAN:

I was interested in Mr. Skerrett's article describing the Davis torpedo-gun, published under the above title in your issue of August 3rd; but in the last paragraph, in which he describes the results of the tests in the Chesapeake, the writer omits to state whether the targets were fitted with torpedo netting or not.

One can readily understand that the effects of such a weapon striking a warship unprotected by a torpedo net would be disastrous; but assuming it were directed against a vessel which had her net out, could the torpedo-gun then do any damage? Is the projecting end of the tripping rod on the nose of sufficient dimensions to be effectually obstructed by the mesh of the net, thereby enabling the resistance apparently essential to cause the release of the shell inside, to be encountered? In other words, is the end of the tripping rod larger than the mesh of the torpedo net? If it is not, is the head of the torpedo armed with any cutting appliance for forcing its way through the net?

From Mr. Skerrett's account, I gather that the tripping rod cannot come into action until an effective obstruction is actually encountered by it. If my reading is correct, and the head of the rod is not larger than the mesh of the net, might not the torpedo simply be caught by the net and lie outside harmless?

Port Elizabeth, Cape. AFRICAN READER.

A Simple Rule for Determining the Direction of Gyroscopic Forces

To the Editor of the SCIENTIFIC AMERICAN:

Permit me to call your attention to an important error in Mr. Pearson's letter (October 26th, 1912) on the gyroscopic action of the Gnome motor in Miss Quimby's aeroplane.

To quote his exact words, your correspondent says (p. 347):

"Take a gyroscopic top. Set it rotating, and hold it in front of you with the axis parallel to your line of vision, so that it revolves clockwise as you look at it, the same as a Gnome motor when seen from the pilot's seat of a Blériot. Turn it sharply to the *left*, trying to keep the axis horizontal. Note that the forward end of the axis dives *downward* in spite of you. Tilt it quickly *up*, and note it swerves to the *left*."

Both of these statements are incorrect. If Mr. Pearson will actually try the simple experiment which he describes, he will find that the behavior of the gyroscope is precisely opposite to that which he predicts. In fact, under the conditions stated, if the top is turned to the *left*, the forward end will *rise*, and if it is tilted *upward*, it will swerve to the *right*.

The fact that an error of this kind can occur in the discussion of so important a case as the fatal accident to Miss Quimby, seems to show that there is still much haziness in the minds of aviators concerning the *direction* of gyroscopic forces. Every one knows, in a general way, that when we attempt to force the axle of a spinning gyroscope out of its position, the axle, instead of yielding perceptibly to the applied force, will move (or tend to move) *in a direction at right angles to the force*. But, unfortunately, there are *two* such directions, and many persons appear to be at a loss to decide between them.

For instance, if we push the forward end of the axle to the left, it will certainly move *either* up or down; but the important question is, which will it be—up or down?

A very simple rule for deciding this question is the following, which was first published by the writer in the *Engineering News* for June 21st, 1910:

Imagine the deflecting force to be exerted by the pressure of a flat board pushed against the spinning axle of the gyroscope, and note the direction in which the axle, if rough, would tend to roll along the board. This will give the required direction of motion for that end of the axle.

This rule is immediately applicable in any position of the axle—vertical, horizontal, etc.—and whatever the direction of the applied force.

For example, in the case cited in Mr. Pearson's letter, a forcible turning of the aeroplane to the left may be thought of as due to a pressure exerted by a (vertical) *board pushing the forward end of the axle to the left*. If the axle is rotating in the direction described, it would tend to roll *up* the board. Hence the aeroplane would rise.

Or again, consider the case of a side-wheel steamboat, where the axle of the revolving wheels is cross-wise instead of longitudinal. A sharp turn to the left is equivalent to a forward pressure on the right-hand end of the axle. If this pressure is thought of as exerted by a board, it is obvious that the axle would tend to roll *down* the board. Hence the steamer tends to list toward the right. Similarly, if the steamer turns to the right, it will tend to list toward the left. That is, the gyroscopic action of the paddle-wheels, in so far as it has any appreciable effect at all, tends to make the vessel list toward the *outside* of the curve.

The rule is thus seen to be capable of rapid and accurate application to a great variety of cases in which any of the older rules seem liable to leave one in doubt as to the correctness of the result.

EDWARD HUNTINGTON,
Assistant Professor of Mathematics, Harvard University.
Cambridge, Mass.

The Bureau of Chemistry and Its Work

To the Editor of the SCIENTIFIC AMERICAN:

One cannot read the SCIENTIFIC AMERICAN for any length of time without being impressed with the keen practicality, the philosophical insight and the fairness displayed in the editorial writings. To such a reader the recent attacks on the Bureau of Chemistry cannot but be disappointing.

Doubtless the Editor is honest in his attitude, but it would seem that a scientific journal would be careful to present conclusive evidence when making an accusation. What basis has the Editor for his statements that the employees generally of the Bureau of Chemistry are incompetent, that there is no harmony or co-operation among them, and that Dr. Wiley, while fearless and honest, is scientifically incompetent?

The principal argument advanced by the Editor to support his charge that the Bureau is incompetent, is that it was necessary to appoint the Referee Board, to check up the results obtained by the Bureau of Chemistry. Is the Editor so naïve that he believes that the principal reason for the appointment of the Referee Board was because of the alleged unscientific character of the Bureau's conclusion adverse to sodium benzoate? Was not a cry of protest inevitable from the users of preservatives regardless of the scientific character of the Bureau's work? It is certainly surprising that the SCIENTIFIC AMERICAN should base its charges upon the appointment and work of the Referee Board in view of the fact that while the scientific character of the board is not seriously questioned there is no unanimity among physiologists as to its conclusions.

While the Bureau of Chemistry is not composed principally of famous and highly specialized scientists I believe that anybody who really knows the Bureau will acknowledge that the personnel is of a very high order. One need but be slightly familiar with current chemical literature to realize to some extent the quality of work being done by the Bureau employees. It is true perhaps that a large percentage of the work is not of a research but of a routine nature. This must be so, as the great bulk of the Bureau's work is securing evidence of law violations and much if not most of this work requires routine examination. This work is required by law. Can the Editor doubt the value of these routine examinations, which lead to the detection of such violations as the addition of wood alcohol to extracts and beverages, or the addition of harmful habit-forming agents to household remedies? This work is well and thoroughly done and the public has reason to be grateful for its protection. Would the SCIENTIFIC AMERICAN do away with this work and occupy the time of the Bureau with such long drawn out and expensive experiments as conducted by the Referee Board, only to arrive at conclusions which are equally indefinite and unsatisfactory?

But the securing of evidence of law violations is not all of the Bureau's work. As an example of the Bureau's desire to use educative means to avoid violations of law take the following instance. It was found that many samples of catsup were being collected which gave evidence of being of unsound, decomposed material. A microchemical expert was sent into the field to visit canneries and observe the practical conditions of manufacture. In his visits to these factories he was not only able to ascertain the source of trouble but by practical demonstrations with the microscope and otherwise he was able to show the manufacturer that he was unintentionally producing unwholesome food. After an entire season of this work the Bureau was in a position to issue useful instructions to the canners. It should be understood that this is only one instance of the Bureau's efforts to educate the public.

But it is the insinuation against Dr. Wiley that is the most unjust of all. The editorial of March 30th, 1912, states that the "Bureau of Chemistry needs a man of such solid scientific attainments that there will be no need of referring his decisions to a Board of Referees." Dr. Wiley's scientific standing requires no defense, but such a statement is so opposed to common knowledge that it should not go uncriticised. Does the Editor consider Dr. Wiley's recognition by the leading scientific and medical societies of the world as being without significance? The SCIENTIFIC AMERICAN truthfully styles the Pure Food Law "Dr. Wiley's Pure Food and Drugs Act." Could a man secure such a law in the face of great opposition unless he possessed intellectual qualities of an unusual nature?

If the SCIENTIFIC AMERICAN possesses evidence of Dr. Wiley's scientific incompetence, it is its duty to present evidence of same.

I must confess that I am somewhat of a hero worshiper in this connection, as are most men who have ever had the privilege of service under Dr. Wiley. There was certainly no lack of harmony and co-operation under Dr. Wiley's leadership. Almost every man, even to the humblest, was inspired to believe that he was engaged in no ordinary work but was a real factor in the Pure Food fight. If discord occurred within the Bureau it did not come from internal causes but from disturbing causes without.

Riverdale, Md. HENRY E. NORWOOD.

[The rank and file of the Bureau of Chemistry are fairly competent, on the whole competent enough to perform effective work under the direction of able division chiefs. We cannot refrain from pointing out, however, that of the six M.D. degrees which are to be credited to six of the Bureau's men, four were granted by a night medical school, the discontinuance of which was recommended by Abraham Flexner of the Carnegie Foundation on the ground that the curriculum was below the standard. One of these M.D.s was awarded to the man who made the benzoate of soda investigations under Dr. Wiley's direction and who at that time was only a medical student. Is it likely that a doctor who has received his medical education in such an institution can compare with a graduate of Johns Hopkins, for example?

Our correspondent urges that the work of the Bureau was principally routine in character; therefore scientific research does not appear prominently. This is the crux of the whole situation. The Bureau has always had a most liberal Congressional appropriation. Money was not wanting for any work that the Chief of the Bureau and his aids wished to carry out. What institution in our country should carry on scientific research for the purpose of aiding the enforcement of the Food and Drugs Act by studying the scientific questions involved in food manufacture and analysis, if not the Bureau of Chemistry? But such constructive work was not put prominently forward, and the positions of the Bureau were not filled by the appointment of chemists who, by past training and proven ability would be able to do such constructive work.

It is evident that our correspondent is not sufficiently acquainted with the leaders of scientific thought in this country. Otherwise he would not believe that the chemists of the Bureau, as well as their former chief, have a high scientific standing among chemists. The benzoate of soda experiments, which Dr. Wiley and those who aided him in the Bureau still persist in regarding as scientifically conclusive, have been repeated by abler chemists with the result that totally different conclusions were reached. Not only did the Referee Board find that the conclusions drawn in the case of benzoate of soda were entirely wrong, but so did Prof. Lehmann of the University of Wuerzburg and more recently Prof. Schattenfroh of the University of Vienna.

These are scientific men who have reputations to sustain. Chemists are more likely to accept their statements than those of Dr. Wiley and those who are responsible for the benzoate of soda experiments. When Dr. Wiley decided that lead (a cumulative poison) could be safely used in baking powder, he revealed not only his own scientific shortcomings but handed down a decision directly against the spirit of the Pure Food and Drugs Act.

One of the division chiefs, whom our correspondent regards as a man of high scientific standing, drowned instead of poisoning rabbits (as he supposed) by running a tube into their lungs instead of into their stomachs, during the course of experiments intended to show that caffein contained in the quantities found in a popular beverage is highly dangerous. During the same experiments rabbits were permitted to contract a contagious mange because the Bureau of Chemistry men had no experience in handling animals. Surely such men are not competent to conduct research work.

In common with every other fair-minded journal in this country, the SCIENTIFIC AMERICAN regrets the appointment of the Referee Board. But it also recognizes the necessity of that appointment, because the Bureau of Chemistry is either unable or unwilling to conduct its investigations in a scientific spirit. Had the Bureau done its work well in the first place, we would never have heard of the Referee Board.

Lastly, we have no desire to belittle the work that the Bureau does in conducting routine examinations that lead to the detection of wood alcohol in extracts and beverages or of harmful habit-forming drugs in household remedies. This is scientifically rather unimportant work. What we expect of the Bureau is not simply analytical work but research of a fine type to determine the physiological effects of substances on which there is practically no literature; research, in other words, that involves high experimental ability. That is the most important function of the Bureau, and in the performance of that function it has failed.—EDITOR.]

The Bagdad Railway

A New Factor in the Turkish-Balkan Situation

By Harold J. Shepstone

All photographs by American Colony, Jerusalem.

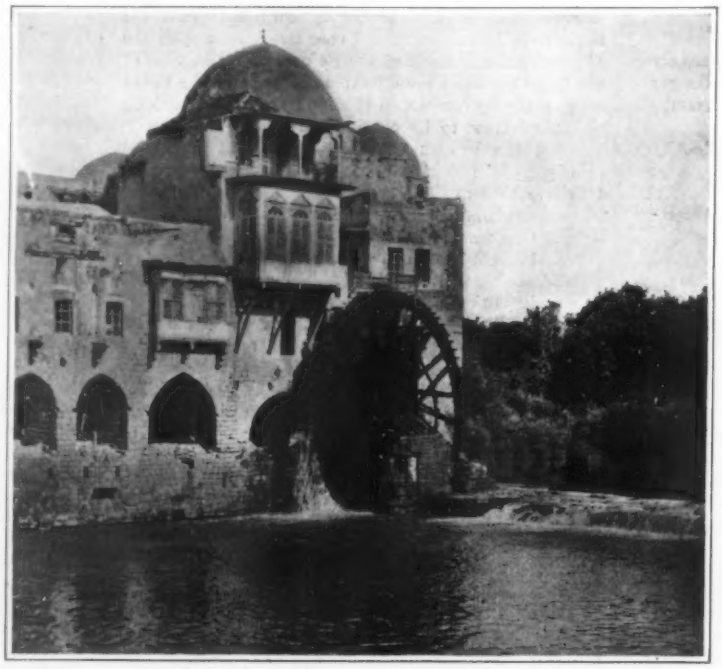
Mersina, port of Adana, where much material for Bagdad Railway is landed.

The reign of the Turk in Europe is over. His future lies to the east of the Bosphorus and the Dardanelles, in that land of history and fable which is about to be restored to more than its one-time prosperity by the coming of the railroad and the irrigating ditch. Very timely is the following story, by an eye-witness, of the construction of the Bagdad Railway.—EDITOR.

THE lines of the Bagdad Railroad having now been successfully laid from Aleppo eastward to the Euphrates valley, calls attention to this daring enterprise which will link Mesopotamia with Europe by an iron road, and, incidentally, the sacred cities of Palestine as well. At the moment an army of 72,000 men are at work upon the railroad, and during the last two years much has certainly been accomplished. Aleppo, in Northern Syria, has been converted into a great railroad-building center. Indeed, it is the principal base of operations, and huge quantities of railroad material have been collected here. Locomotive works and repair shops have been built as well as large temporary barracks for the workers. On what is known as the Aleppo section there are now five hospitals with ten doctors and many nurses who attend to all cases of accident and sickness among the workers free of charge.

This activity on the much-discussed undertaking is the more extraordinary when it is remembered that from October, 1904, until the latter part of 1909 not a yard of steel was laid or a spade put into the ground. The reasons for this long delay were certainly many, and to properly appreciate them it is necessary to briefly review the history of the Bagdad enterprise. It was in January, 1902, that a Franco-German syndicate obtained a concession from the Turkish government to build a railroad from Konia, the terminus of the German Anatolian Railroad in Asia Minor, to the Persian Gulf, a distance of 1,460 miles, or 1,870 miles from Scutari, the Asiatic suburb of Constantinople on the other side of the Bosphorus. The work was to occupy eight years, provided the money was forthcoming, and it was estimated that the line would cost about $100,000,000 to build. It soon leaked out that the syndicate was a group of German financiers, with the result that British statesmen did not regard the enterprise at all favorably, more particularly as its ultimate object was to tap the Persian Gulf. This was but natural, for eighty-eight per cent of the trade of this region is in the hands of the British. The British argument was that she had spent blood and treasure freely in opening the Gulf to trade and that the maintenance of British supremacy there was an integral part of her Asiatic policy.

Again, Great Britain recognized that the syndicate, or rather the Germans, had the best of the bargain. Turkey was to find the money and the Germans were to build the railroad with German material and by German engineers. In 1903 a practical start was made. The Turkish government handed a loan of $9,500,000 to the syndicate for the erection of the first section of the road. Instead of costing this sum to build only $3,000,000 was expended. There was a clear profit on the construction of $6,500,000. This first section of the Bagdad line runs over a dead level plain, and crosses only one small river. So construction was done as cheaply as it could possibly have been. Section number two, however, traverses the Taurus Mountains, and it was discovered after careful survey that $15,000,000 would be needed to carry the rails over this route. The financial arrangements being the same as before, Turkey was prepared to find $9,500,000, but this was not sufficient; while it appears that a large proportion of the profits made on the first section had been distributed among the shareholders of the syndicate. The result was several years delay, caused principally through the want of money and also by political and other disturbances in the Turkish Empire, to say nothing of the action of Great Britain in demanding that her rights in the Persian Gulf be safeguarded. The upshot of all these discussions was that the Germans not only got over the money difficulty, but obtained loans from the Turkish government amounting to $37,500,000 to enable them to carry on the work over more than one section at a time, while England was provisionally satisfied by an arrangement by which the line from Bagdad to the Gulf should be built by an English company and be purely international in management.

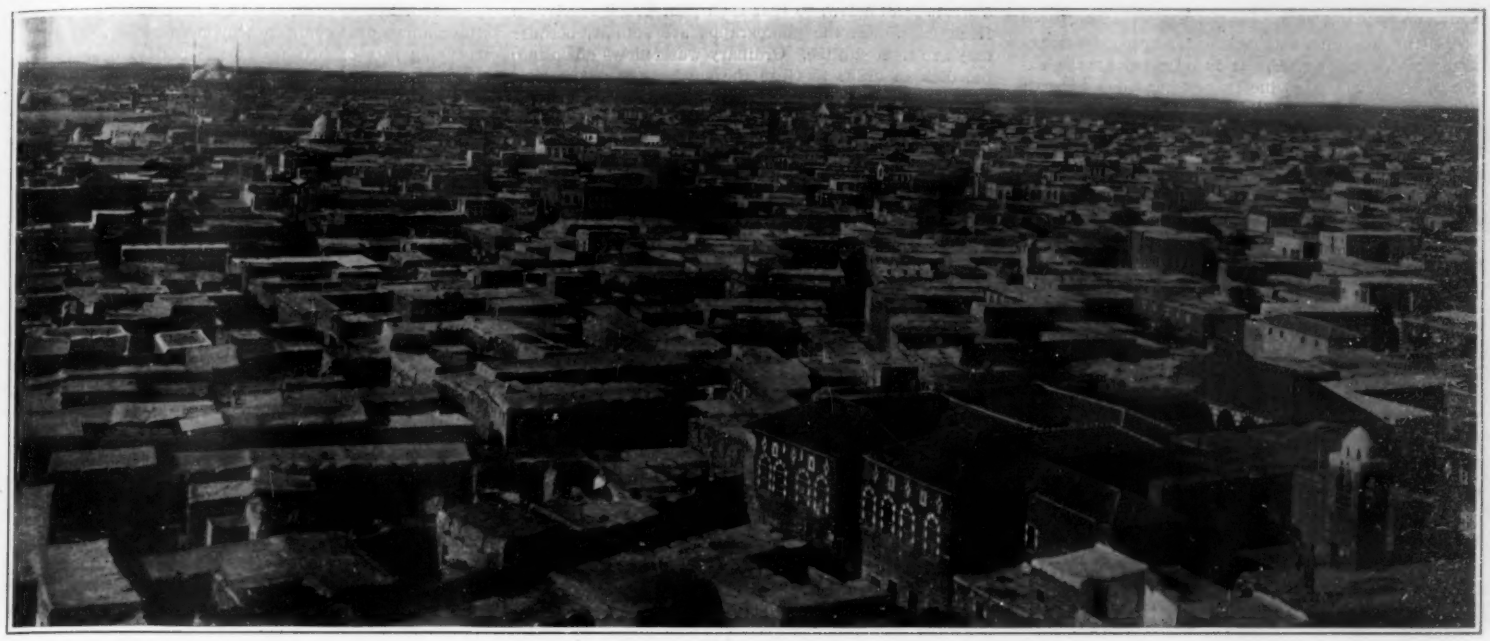


One of the famous Naupas water-wheels of Hama.

Castle at Tripoli, taken after five years' siege by Count Raymond the crusader, in 1104.

Having briefly outlined the reasons for the long delay, let us glance at the work now in hand. The enterprise has been divided into four sections, the first extending from Konia to Adana, the second from Adana to Aleppo, the third from Aleppo to Mosul on the Tigris, and the fourth from Mosul to Bagdad. As already explained, an English company will carry the lines from Bagdad to the Persian Gulf, and this section is to be purely international in its management. To discover how the work was progressing, the writer, in company with some photographers of the American Colony in Jerusalem, journeyed north from that city to the seat of operations, visiting Aleppo and tramping eastward over the partially completed road toward the Euphrates. We also made excursions to Tripoli, Alexandretta and Mersina, the ports to which the material for the building of the road is brought. Speaking generally, the officials were very reticent about giving information, though no objections were raised to our visiting the workyards and taking photographs.

Over the three sections stretching from Konia to Mosul, an army of 72,000 men is at work. From Konia the line is already opened to traffic as far as Ulukishlar at the very foot of the Taurus Mountains. The lifting of the track over these mountains and dropping it down again into the Cicilian Plains on the other side is proving a very arduous piece of work. However, capable engineers are grappling with the difficulties and they should be overcome within



Homs, one of the largest cities on the French Beyrout-Aleppo Railway. The roofs of the houses made of mud and straw. The new (French) houses in foreground are tile-roofed.

the next two or three years. There are some particularly deep chasms to be spanned and much blasting away of rocks to provide a bed for the track. Meanwhile the track is being rapidly laid from Adana westward toward the Cicilian Plains as well as eastward in the direction of Aleppo. For some months past material for this section of the road has been sent up over the short line from Mersina, a small port on the Mediterranean in Asia Minor, to Adana. This railroad was built some few years ago by the French, but has now been purchased by the Germans.

Then from Aleppo, the principal base of operations, the builders have pushed eastward toward the Euphrates, which has now been reached, and northward to Osmaniyeh on the way to Adana. The activity at Aleppo is remarkable. A few years ago it was a sleepy old-world Syrian city. Now all is bustle and activity. At the present time building material is being brought here for the railroad over the French line from Tripoli. From this port a train of twenty to twenty-five cars of railroad building material reaches Aleppo daily. Soon the erection of an imposing station will be commenced at Aleppo, to cost over a million Turkish pounds. Aleppo is not on the main line, but Moselmieh a little distance to the north will be the junction of this great system of Asiatic railroads. But all trains will go to Aleppo over the short branch line connecting it with the junction. Then within the next few weeks the erection of a temporary wooden bridge over the Euphrates will be put in hand, so that the rails may be laid with all possible speed to Monsul. Much of the embankment along the route here has been already made. The temporary bridge over the Euphrates will be replaced

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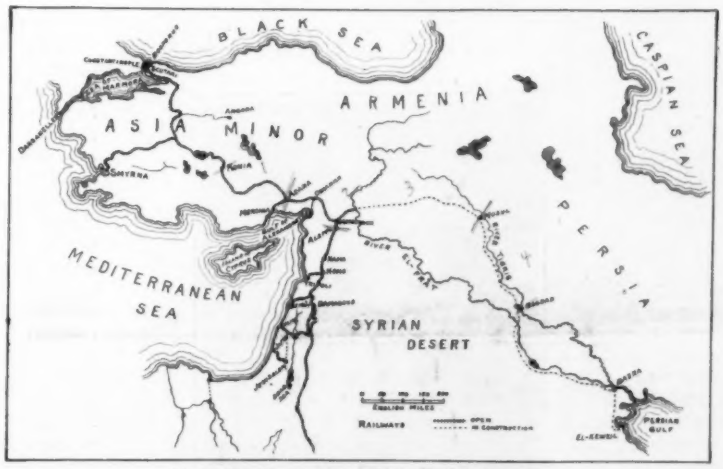
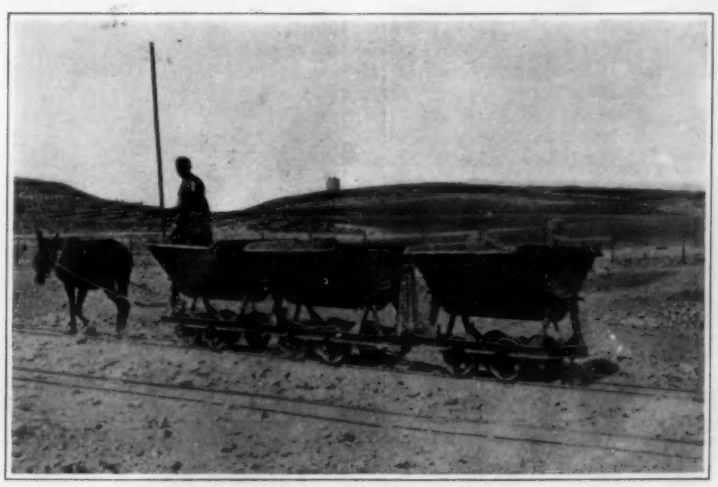


Map showing route of Bagdad Railway.

Lumber for the temporary Euphrates bridge. Note fine track.

Train from Aleppo arriving at the Homs station.

The old way.



A "dirt train," Bagdad road, near Aleppo.

An oriental double-decker.

Vacuum Cleaning Attachment for Automobiles

A VACUUM cleaning attachment for automobiles has recently been invented. It is operated by the exhaust gases from the engine by passing them through a suitably designed nozzle and vacuum chamber. The principle of operation may be likened to that of the injector as used with the steam boiler. The exhaust gases create a suction in the hose as they leave the nozzle and pass the opening in the vacuum chamber. Any dirt or dust will be picked up by the cleaning tool or brush and discharged to the atmosphere through the exhaust tube.

The device is installed on the car in the same manner and place as the ordinary muffler cut-out valve. This is accomplished simply by cutting out a short section of the exhaust pipe ahead of the muffler.

The invention renders it possible to finish a long day's run over dusty roads clean and free from dust. Clothes as well as the car can be cleaned.

Vacuum-cleaning an automobile.

The exhaust gases of the motor create the suction.

Back Rest for Locomotive Engineers

WHILE almost everything possible has been done by different railroads for the benefit of the traveling public, very little thought has been given to the man at the throttle, sitting for hours in a narrow cramped position, his mind taxed to the full limit, his body at a terrible strain. The percentage of deaths from Bright's disease and other kidney disorders is very high among locomotive engineers, and it is claimed that this is due in large measure to the continued jar of the engine. With a view to ameliorating these conditions, an inventor hailing from Montgomery, Alabama, has invented a portable back rest, a view of which is shown in the accompanying illustration. The back rest is made of canvas, which is attached to the seat, while the upper end is secured to coil springs, which are hooked to the ceiling of the cab. The springs relieve the engineer of a great deal of jarring, permit him to occupy a much more comfortable position, and consequently make him more efficient, particularly on long runs. The back rest may be rolled up into a small package, weighing altogether less than a pound and a half. The device has already been put to the test of actual service on the Louisville and Nashville Railroad, and has been heartily indorsed by the engineers.

Back rest for locomotive engineers.

A New Slot-machine Camera

THE new automatic photograph machine which we here illustrate is an example of great ingenuity as applied to its conception, as well as a most careful working out of all the details. It is the invention of H. Ashton-Wolff, an electrical engineer, who succeeded in completing it at Paris after many years' work. It is a coin-operated machine which uses electricity throughout, and one of the main points is that instead of the old-fashioned tin-type, it gives an artistic portrait upon a platino-bromide postal card. It appears that this is the first time that an entirely automatic machine is able to make an attractive and durable photograph of this kind, and in fact the new apparatus is attracting much attention and is considered a great advance upon what has been heretofore produced.

In order to take the photograph, the person inserts the proper coin into the slot and from there it drops down behind a small glass screen, where it remains visible during the process, only falling into the cash box when the finished picture is delivered. This is a good means of obliging the public to use real coins, for the inserted coin being in plain view is seen by the bystanders, etc. As the coin is inserted the machine starts, a bell rings and a sign becomes luminous containing a red cross to fix the attention. Next it is a small mirror arranged like the finder of a camera, which shows the sitter if he is in the center of the photograph. Proper directions for this are given in an inscription placed on the machine. An artificial light comes into action as well as a bell and a second electric sign requesting the sitter not to move. The exposure, which is instantaneous, takes place; then the light goes out and another luminous sign indicates that the sitter can leave the apparatus and wait for the picture to be delivered.

After the exposure is made, the photograph card drops down into a closed ebonite dish, into which the developing solution flows, this coming through ebonite tubes. As soon as the card is developed—and it is to be remarked that it develops a positive picture instead of a negative by means of new chemical processes which have been discovered after long research—the developer flows out of the dish into a waste tank below, so that each photograph receives a fresh bath. All the photographs are similar, because they are treated alike. Ordinary water flows down into the disk in order to rinse the card. After that it is fixed in the same dish by a special fixing chemical. It is then washed and all the chemicals are well eliminated. The dish in which all these operations take place then opens below, and the finished card drops down into a drying device, which dries the photograph by whirling it centrifugally. This special device is a new invention and dries the picture without softening the gelatine, as is remarked in the case of heat dryers. The photograph is thus dried in fifteen seconds. Electromagnets are then brought into play to stop the dryer, and when it is at the full stop it comes into a vertical position and the finished card drops out through a slot and is delivered.

All the parts of the apparatus are so arranged that should a leak ever occur, the chemicals cannot by any means reach any working parts of the device, but are forced to flow into a protective ebonite tank and from there down into the waste tank.

To bring about all the movements of the electric devices in the proper manner, a rotating contact device or distributor is used, which is a fixed disk of insulating material, having upon it numerous contact pieces after the manner of a controller, upon which sweeps an arm carrying sets of brushes so as to pass over the contacts and close the circuits of all the electromagnets in the proper order. A small electric motor drives the arm around the distributor, and one revolution serves to make all the contacts.

Should by any chance anything go wrong with the machine and no photograph be delivered, the coin which has until now remained in full view of the sitter is returned to him instead of dropping into the cash box. A very strong artificial light for the exposure is obtained by the use of over-volted incandescent lamps.

The machine furnishes one hundred postal card portraits on a single charging, and is worked entirely by electromagnet devices combined with electric motors, so that there are no springs, cams or levers used in the apparatus. All the photographic solutions will keep for at least one month. Each of the parts is a separate mechanism which can be taken out at once, and no wires need be detached, as all the contacts are made by spring pieces. About ten minutes are needed for recharging the machine. The value of the apparatus is increased by the use of special devices for electric flash signs which can be readily applied in any combination. As the photograph comes out, a luminous hand draws the sitter's attention to a second slot, and dropping a cent into it secures a transparent envelope for the postal card view.

The apparatus closed.

The apparatus open.

New slot-machine camera.

An Early Type of Cotton Raised in the United States by the Hopi Indians

THE origin, growth and development of the cotton industry in the United States has received considerable attention from historians, ethnologists and statisticians. Much interest has been manifested in the identity and description of the varieties which formed the foundation of the American upland cotton, but only recently has there been a systematic study and analysis of the types of plants which make up the field crops to-day, with a view of accomplishing this object.

Although it is difficult to ascertain the actual extent of the influence of native species of cotton on the character of the present-day types, it is felt that they have been influenced more by the importation of tropical and European cottons than by any original American ones. With a view of elucidating the history of one form of native cotton, Mr. Frederick L. Lewton, of the U. S. National Museum, has written a pamphlet entitled "The Cotton of the Hopi Indians: A new species of Gossypium," forming publication No. 2146 of the Smithsonian Miscellaneous Collections.

The fact that cotton was used and of necessity cultivated by the Indians, is recorded by several early Spanish explorers, as it has been more recently by many ethnologists. In the villages of the cliff-dwellers of Mesa Verde National Park numerous fragments of cotton cloth have been unearthed, and in Utah the seeds of the plant itself have been found.

To-day, among the Hopi Indians of Arizona, the cotton plant is highly esteemed, and its fiber enters into many of their ceremonies, as well as into many practical household activities. It is considered essential by them that all strings employed in religious services be of native cotton. These strings of cotton are used to bind together prayer sticks and offerings of all kinds, and are placed in the trails entering the pueblos where ceremonial services are in progress; the badges of the chiefs are all wrapped with native rough-spun cotton strings; and cotton is also used to weave ceremonial kilts, belts and blankets.

Unfortunately the native Hopis, once deft in the art of weaving blankets, mantles, rugs and other articles from cotton, now find it far easier to purchase either the yarn already spun, the cloth already woven, or the complete garment, and thus the art is gradually being lost. Cotton is still cultivated by them, however, to a small extent, in a village in the Western Navajo Reservation, and in one of the Moqui.

The Department of Agriculture has carried on experiments with Hopi cotton for the past seven years. This particular species of cotton is remarkable for the rapidity with which it grows and the early date at which it blooms, it being the earliest to blossom of several hundred species put to test.

As to history and development of this particular sort of cotton, Mr. Lewton describes botanically the distinguishing features of a new species which he calls *Gossypium hopi*, and which is illustrated by five plates showing the growing plants, the flowers, and the maturing and ripe bolls.

A Home-made Portable Anemometer

By Albert Bracke

AVIATION has created a demand for portable instruments for ascertaining the velocity of the wind. A simple instrument of this sort which is adapted to be used in conjunction with a watch, preferably a stop-watch, is illustrated in the accompanying engraving. It consists of a thin brass rod provided with a suitable

Home-made portable anemometer.

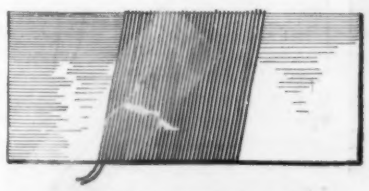
handle. The rod is divided into three sections; the section nearest the handle is unthreaded, the middle section is threaded, and the outer section is graduated, but not threaded. Mounted on the threaded portion is the rotary part, consisting of a nut provided with four arms terminating in small cups after the fashion of the common anemometer. The cups must be so positioned that their convex sides will be in advance as the nut follows its spiral course down the rod. The nut carries a sleeve which is of exactly the same length as the graduated portion of the rod, so that when the nut is at the top of the threaded portion, the end of the rod will be just covered by the end of the sleeve. In this position the nut may be held by means of a set sleeve which the operator slides up against it. When it is desired to measure the velocity of the wind, the anemometer is held in such a position that the wind has unhampered access to the cups of the rotary part. Then the set sleeve is retracted and the anemometer is permitted to revolve and pursue its slow spiral course down the rod. At the end of ten seconds this motion is checked by means of the set sleeve, and then the graduated portion of the rod projecting above the sleeve carried by the nut will indicate the velocity of the wind in feet per second or miles per hour, depending upon the nature of the graduation. The rod may be graduated by comparing it with a standard anemometer or by carrying the instrument on an automobile at fixed speed through still air.

Method of Making Selenium Cells

By Philip Edelman

SELENIUM can now be obtained in fused sticks or plates at about seventy-five cents an ounce. It is prepared from compounds of selenium which are found in the dust from furnace flues where sulphides are burned in the manufacture of sulphuric acid. This is oxidized to selenious acid, which is treated with sulphurous acid to give selenium. It thus forms a valuable by-product of what was once thrown away as useless.

Selenium exists in two allotropic forms, a red amorphous powder obtained as above and a dark gray mass obtained by melting and suddenly cooling this red powder. In addition to these, crystalline forms are obtainable by heating the gray solid form of selenium in semi-inclosed vessels with varying amounts of air.



Construction of selenium cell.

These are usually either white or pink. They may be obtained by heating a portion of the gray solid selenium in an evaporating dish, covering or partially covering the dish with a clear piece of glass. Care must be taken or else the glass plate will crack. The crystals form on the glass plate. By varying the opening and supply of air different effects are produced. The red poisonous fumes which arise from the melting selenium are an oxide of selenium, which may be collected by holding a glass plate at some distance from the evaporating dish, where the vapor condenses on the glass plate. Little gray-black globules of selenium collect on the inside of the evaporating dish.

Chemically, selenium acts very much like sulphur. Heat is necessary for nearly all its actions with other elements. It has a very strong affinity for lead, tin, and zinc, and when a little of either of these metals is thrown on some melted selenium, some pretty fireworks take place and a selenide of the metal is formed. None of the acids acts very energetically upon selenium. The gray solid form is insoluble in carbon disulphide, but the amorphous form is soluble in it.

The gray solid form is the only one which is suited for electrical use. As it comes in sticks or plates it has a very high resistance, and is indeed almost an insulator. This is not so strange when we consider its close relation to stick sulphur, sulphur being one of the very best insulators known. Indeed, it was discovered that the resistance of selenium varied with the light to which it was subjected, while it was being used as a resistance for telegraph work.

The essential points in a selenium cell all hinge upon obtaining a very thin film of selenium on some closely adjacent conducting wires. After countless futile trials the cell shown in the drawing was constructed. Its dimensions were 1 inch by ½.

A piece of clear mica ½ inch wide and 1 inch long is cut out, and beginning ¼ inch from one end two separate enameled copper wires are closely wound until within ¼ inch of the other end. The writer uses No. 40 enameled wire for this purpose, although No. 24 B. & S. enameled wire has been used successfully in the same way. The enamel is then very carefully scraped off the copper wire by means of a very fine jeweler's file until the metal shines through. This grid is now placed on a spoon or other holder and heated. When heated some selenium is quickly and evenly rubbed on it from a stick of selenium. Since the selenium melts and flows like sealing wax this part is not difficult. The grid is then quickly placed on a smooth flat surface and a small piece of clear glass ½ by 1 inch pressed down upon it with heavy pressure. This method insures a very thin film of selenium, which will adhere permanently to the grid. It should be so thin that it is semi-transparent. The glass piece is left on the grid permanently. The cell is then placed in an oven where it is allowed to bake at an even temperature just below the melting point, for several hours. It should then be taken out and suddenly cooled. The whole operation is a delicate process, but once mastered the making of the cells is simple. Connection is made to the ends of the two fine wires. The cell should be mounted so that the light can reach it from all sides.

The cell when constructed will still have considerable resistance, so a battery of a number of cells will be necessary. When proper pains and care are taken a cell sensitive enough for all ordinary experiments will be the result.

An Improved Phosphoroscope

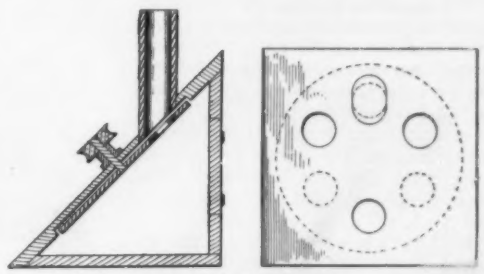
By Walter C. Belcher

POSSIBLY no easily constructed scientific instrument will afford more entertainment than a phosphoroscope; yet not one instrument maker in fifty would know what was desired were one ordered from him, nor does one ever see them in physical laboratories. The instrument will amply repay the little time necessary for its construction, and will furnish an ever-varying display, rivaling an endless variety of Geissler tubes, and, furthermore, no batteries, coal, or static machines are required. Nearly all substances are phosphorescent to a degree; calcium sulphate (luminous paint) being probably the best-known example on account of the duration of its "discharge" or glow. In order to know if a substance has this property, we must expose it to light and then examine it in the dark. Obviously, if the duration of its glow is very short, we could not do this unless an instrument designed for this purpose were at hand.

Becquerel devised such an instrument, consisting of a drum or box which has an opening in each end. In this drum revolve two disks mounted on the same axle and pierced symmetrically with the same number of holes. They are mounted close to the ends of the drum, and are so adjusted that when a hole in one disk is opposite the hole in the corresponding end of the drum, the second disk closes the hole at its end and *vice versa*. The object placed in the drum for examination is thus exposed to light and to the eye in as rapid succession as may be desired when the axle is revolved.

The writer prefers an instrument having only one fixed and one rotating plate, pierced symmetrically with the same number of holes, except that the fixed plate has an additional hole at the same distance from the center as the rest. In this hole is inserted a tube serving as a sight tube, which should be made of sufficient length to allow the eye to focus easily on the object to be examined. A small electric motor direct connected provides a neat way of driving.

One application of this instrument which the writer believes novel is its use either with or without a microscope in the determination of obscure particles in crystalline rocks; and doubtless many other applications would probably be found. Coral, lime, glass, sulphate of quinine solution, etc., are beautiful objects. A



An improved phosphoroscope.

key to phosphorescence is given in the fact that the "glow" of an object is always the color absorbed when viewed by direct light.

A Finder for a Three-inch Telescope

By Ralph D. Rust

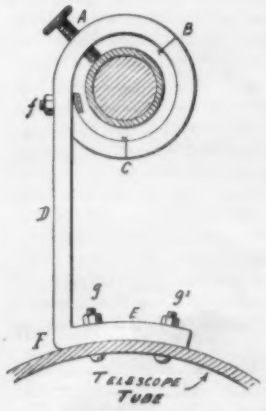
IT often takes considerable time to locate a small object when one is using a high-power eyepiece. A finder such as dealers sell for this purpose offsets the difficulty, but the price is often quite beyond the possibilities of a boy's pocket book. A small telescope can be purchased for two or three dollars, but perhaps one much cheaper and just as efficient may be found in a second-hand store.

When a suitable glass has been obtained remove the first set of lenses in the eyepiece tube and thus convert the terrestrial telescope into an astronomical one. This will make the instrument from 3 to 6 inches shorter.

Procure two strips of brass 5/16 inch wide, 3/32 inch thick and 10 inches long, six brass set-screws, and six 3/8 inch brass bolts. Take one of the strips first; flatten one end of it, and bore a bolt-hole in it. Measure the distance around finder tube; measure off this distance on the brass strip starting from the center of the bolt-hole, and add enough so that when the ring is made its diameter will be at least ¼ inch more than that of the finder. Bend the strip as shown in the drawing, bore a hole at *f* and secure the ring with a bolt. Mark off points *A*, *B*, and *C* on the ring at equal intervals, and drill and tap the holes for the set-screws. Bend the strip at *F*. The part *D* should not be more than 3 or 3½ inches long or it will vibrate too easily. Drill holes at *g* and *g'* in the foot *E* and bend the foot so that it will fit the telescope tube snugly. Bore holes in tube and bolt the foot as in the drawing.

The second support is made in the same way, except that the ring need not be so large, for it should fit over one of the draw pieces of the finder. The rings of both supports should have their centers in a straight line parallel with the axis of the telescope.

The finder is adjusted by moving the set-screws about until a distant object in the center of the field of the large telescope appears in the center of the finder field. This device is not expensive and saves considerable time and trouble.



Finder for telescopes.

Inventions New and Interesting

Simple Patent Law: Patent Office News: Notes on Trademarks

Another Substitute for Pneumatic Tires

THE effort to find a satisfactory substitute for the pneumatic tire has resulted in scores of inventions covering all sorts of combinations of mechanical parts. The principal difficulty with most of these inventions lies in the fact that they do not distribute the shock over the entire wheel as does a pneumatic tire. When the wheel runs over a stone the impact is concentrated upon those parts which are in immediate contact with the stone, putting them to such a severe strain that sooner or later they must break. In the case of pneumatic tires, however, the compressed air distributes the load over the entire tube, so that the whole tire assists in withstanding the shock.

Recently a new form of pneumatic tire substitute has made its appearance which depends not on springs or pneumatic plungers, but on the resiliency obtained by pliable bands under tension. With a tire of this sort the blows occasioned by striking a stone are not localized, but are distributed over a third or more of the circumference of the wheel.

Fig. 1 shows the tire being assembled on the wheel, also the tools used in mounting it on or removing it from the rim. Normally when the tire is fully assembled an annular guard plate covers the inner tension band. It will be observed that there are three sets of bands. The outer band has a heavy rubber face to give a good tread surface. The body of the band, however, consists of layers of specially prepared canvas. A portion of this tread surface is shown in the insert in Fig. 1. Riveted to the inner surface of this band are a number of aluminium cups arranged in pairs. These are adapted to fitover aluminium blocks projecting from the intermediate part of the tire. This intermediate part (see Fig. 3) consists of two bands made up of canvas layers and connected by tubular blocks which are riveted fast. Intermediate of these blocks on the outer band are the aluminium blocks just referred to, which are adapted to fit the cups on the tread band. A similar set of blocks is attached to the inner periphery of the inner canvas band, and these blocks are arranged to enter cups secured to the rim as shown in Fig. 2. The rim is provided with lugs between which these cups are fitted. Each of the cups is formed with a head at one end to prevent it from being displaced endwise from the rim. The blocks are alternately disposed as indicated in Fig. 2.

When applying the tire the cups are first removed from the rim, then the tire is assembled with the tread in place, and is slipped upon the rim of the wheel. This done, every second cup is slid into place, the bands being raised successively by means of a pair of tools, as shown in Fig. 1. The tools consist of flat bars with the ends turned at right angles, so that by slipping the flat side of the bar under the canvas and then turning the bar at right angles, a powerful lifting action may be secured. After every second cup-shaped block has been fitted into place, the intervening blocks are introduced, making the tire cling very tightly to the rim. Now when the tire rides over a stone, the bands are flexed, increasing their tension, and, owing to their resiliency, causing them to yield to a certain extent. The aluminium bearing blocks on the middle portion of the tire are cylindrical in form, so that they can turn in the cups and yield in this way to the deformation of the tire. The elasticity of the canvas band causes the tire to return at once to its normal condition on passing the stone.

Tires such as these have already been introduced in England, and they are now being demonstrated in this country. The tire is adapted not only to pleasure vehicles but to motor trucks as well. In the latter case, however, instead of using canvas bands, the bands are made up of steel links and a heavy rubber block tread surface is provided.

It will be evident that if the bands stretch the slack will immediately be taken up by the weight of the car on the wheels. No harm is done by riding with slacked wheels as long as the slackness is kept below a certain maximum. The tension of the bands may be regulated by introducing aluminium shims under every cup on the rim and subsequently, if necessary, under every rim.

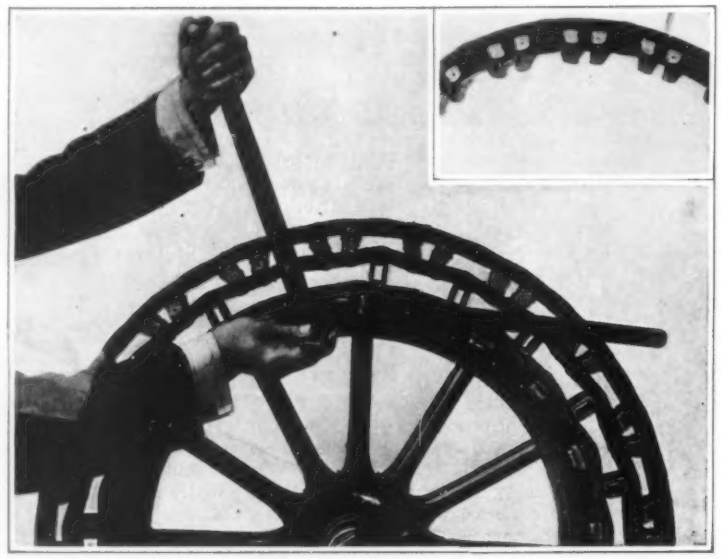


Fig. 1.—Method of introducing the rim cups. The insert shows a part of the tread band with the bearing cups.

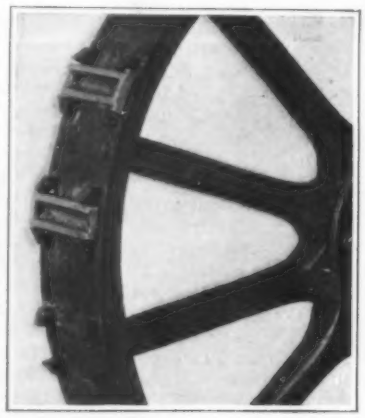


Fig. 2.—A portion of the rim, showing two of the bearing cups in place.

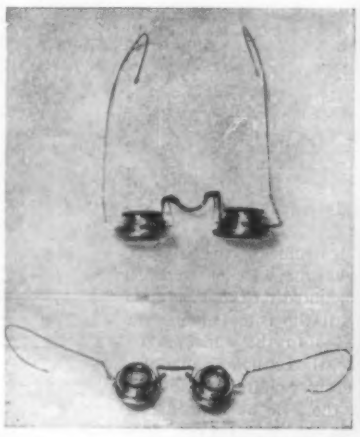
Fig. 3.—The intermediate part, made up of canvas bands rivetted to aluminium blocks.

New Kind of Eyeglasses Made With Telescopic Lens

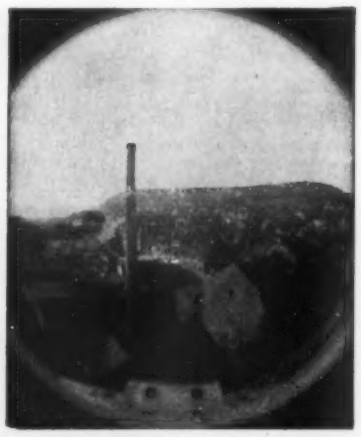
By Dr. Leonard Keene Hirshberg.

DR. K. L. STOLL, of Cincinnati, has devised what has proved to be a revolutionary method of correcting poor eyesight.

During the first quarter of the nineteenth century, the telescopic spectacles were used for high myopia, or nearness of sight, but their theory had not been worked out mathematically. This was later performed by Dr. M. V. Rohr, who demonstrated theoretically and by experiment that they may be used with advantage.



Eyeglasses with telescopic lenses.



Magnified view through telespecs.

In near vision the myope will approach the objects closely to the eye in an attempt to gain larger images. However, this is not very comfortable, for the images are closer to the eye than the objects in proportion to the strength of the concave glasses. These persons prefer to read without a glass, because they thus obtain larger retinal images and a better angle of distinction. But they are exposed to two dangers; they may lose their binocular vision or increase their myopia by complications resulting from being too close to the objects. The operation will safeguard against the latter danger. The following disadvantages of correction with glasses are to be considered: (1) The usually-worn biconcave glasses do not allow correction of astigmatism of oblique bundles. As a result of this, the field becomes so ill defined at a small distance from the center of the glass that it cannot be used for distinct vision. (2) The field of vision will assume a "barrel shaped" distortion toward the margin of the glass. This is of very special importance. Fig. 1 shows the picture of a landscape. Only the small central portion is well defined, and the outside is misrepresented. This is held responsible for most patients' to wearing strong concaves. Elevations and vibrating motions may cause headache, uneasiness and dizziness.

The operation will eliminate astigmatism of oblique rays and distortion, and will reduce these two disadvantages in patients who are compelled to wear glasses so greatly that they need not be considered.

At present, however, after an experience of about twenty years, the operation is considered to be dangerous and used only in a limited number of cases, especially in those where correction with glasses cannot be obtained.

Nevertheless, the consideration of binocular vision, the degree of the myopia, the age of the patients, and the existing complications will limit the result of the operation to such an extent that a substitute seems desirable.

The images of objects may be enlarged by telescopes as the only means to enable a myopic person to see well at a distance. The weight, reduced field of vision, and clumsiness of the glasses, however, limit their usefulness. A much more perfect instrument is the *Fernrohrbrille*, or telescope spectacles, consisting of a combination of a convex objective with a concave ocular. It has to be fitted to each individual case with specia. consideration of the turning point of the eye and the attempt to produce as large a field as possible.

These spectacles were applied to a patient, and he was advised to walk toward the Snellen alphabet from a distance at which he could not recognize them until he was close enough to see them distinctly. The letters were hung up in various positions, so as to entirely eliminate the aid of memory. The light was always the same, and the examination took place each time after an equal adaptation to light, lasting half an hour.

The visual field was taken only in the horizontal meridian, using a large goniometer of five-meter radius, the center of which the patient had to look at with his head fixed. After this the types (Snellen's hooks) were removed to a point where the patient, still keeping his head steady but just moving his eye sideways, could not see them plainly any longer. The latter results were more satisfactory as to vision than those shown in the former. This is caused by the greater accuracy of the method and the types employed.

Herewith is a photograph of the "telespecs." They remind one of automobile goggles, although they are not as conspicuous.

In conclusion it is hoped that with their aid new points may be gained for the study

of the progressiveness of myopia and the prevention of complications.

Notes for Inventors

Rotating a Pump Valve.—In patent No. 1,041,165 Hugh H. Riley of Memphis, Tenn., shows a pump valve with which are connected curved vanes whose outer edges are disposed in the same vertical plane as the outer periphery of the valve, the vanes being adapted to rotate the valve when the latter is reciprocated.

A Food Package Made of Cheese.—A New York city man, James A. Kavanagh, has secured a patent, No. 1,042,119, for a food package which is defined as consisting of a small section of cheese adapted for retail distribution and a paper wrapper perforated at suitable points to provide vents for the escape of the gases created by the fermentation of the cheese.

Phonograph Improvement.—John H. J. Haines of New York city has secured patent No. 1,042,110 for an improvement in phonographs or similar talking machines in which there is a combined recording and reproducing head combined with a weight which may be shifted to and from the head so as to adapt the head for use as a reproducer or as a recorder.

A Neckless Glass Globe.—In patent No. 1,041,886, to Harry A. Schnelbach, Crafton, Pa., assignor to Jefferson Glass Company, of Follansbee, W. Va., is shown a neckless glass shade or globe with an opening at the top. A separate neck extends through the opening and has its lower end enlarged and is also provided with outwardly extending projections on which the shade rests in such manner as to provide a space between the shade and the neck, the neck having means for engagement by the shade-holding devices.

Locating the Source of Sound.—A so-called locophone has been patented, No. 1,035,920, by Frank Della Torre of Baltimore, Md., for a method of determining the direction of a sound wave or of locating a source of sound, and in doing this the waves emanating from such source are divided and the divided parts are compared by bringing first one part and then another through a common conductor. He employs an apparatus including two diametrically opposite receivers, the direction of the source of the sound waves being determined by stopping one of the said receivers, thus indicating into which of the receivers the particular sound wave was received.

Automobile Improvement.—Many roadsters are supplied with a single back seat after the fashion of a rumble. Ordinarily the engine and chassis of this type of machine are adapted to as heavy a load as those of a five or six passenger car. It is believed some provision can easily be made to supply seats on opposite sides of the rumble by means of a suitable frame carrying the extra seats at its ends and attachable to the single or rumble seat. The problem will involve easy application and removal, security when applied, freedom from rattling when in place and out of place, and the provision of proper foot-rests for the occupants of the extra seats.

Brain of a Patent Expert.—In a recent publication Dr. Edward Anthony Spitska, the brain specialist of Philadelphia, is reported to have credited the late Edward H. Knight with having the largest American brain of record. Mr. Knight was well known, especially in Washington city, where prior to his entry into the Patent Office he was connected with the office of Munn & Co., and was occupied in the preparation and prosecution of patent applications. At the same time he was busy with the preparation of his Mechanical Dictionary. He entered the Patent Office January 1st, 1872, and remained in such office until August, 1876. Mr. Knight's brain with a weight of 1,814 grammes compared well with that of Turgenef, Russia's poet and novelist, at 2,012 grammes, and said to be the heaviest of record, and the next heaviest recorded American brain, that of Gen. B. F. Butler, the weight of which is given as 1,758 grammes.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Pertaining to Apparel.

REMOVABLE HEEL.—L. KALINA, care of Midget Manufacturing Co., 23 Duane St., Room 410, New York, N. Y. This improvement relates to heels for shoes, and an object is to provide a shoe having a replaceable heel of leather, rubber or composition, so that even a person unskilled in the art may readily remove a worn heel and replace the same by a new one.

Of Interest to Farmers.

ROLLER HARROW.—J. E. CARLSON and G. J. NASON, Box 14, Rosedale Rural, Bakersfield, Cal. The invention relates to harrows in which rollers are provided with fingers so arranged as to harrow the ground. The invention provides means for clearing the rollers of trash, since the effectiveness of the roller harrow is greatly lessened by the collection of weeds and trash on the teeth.

Electrical Devices.

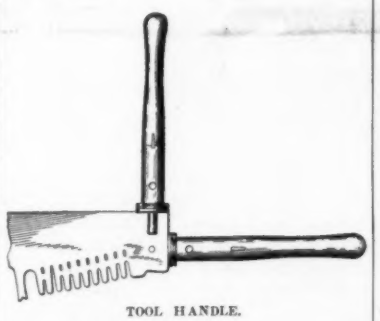
TELEPHONE ATTACHMENT.—D. W. LEPPERT, 1045 3rd Ave., Manhattan, N. Y., N. Y. In this case the invention refers to an attachment adapted to be secured to a telephone instrument, so that a strip of writing material, such as paper, can be unrolled, and any conversation coming over the telephone taken down.

Of General Interest.

CUSHIONED HORSESHOE.—G. E. MCKINNON, Little Falls, N. J. This invention comprises means for cushioning the footfall of the animal wearing the horseshoe. This end is attained by detachably securing to the under side of the shoe a strip of rubber or other suitable material, which forms a resilient tread for the shoe.

Hardware and Tools.

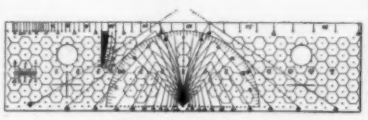
TOOL HANDLE.—ARCHIE MCDERMID, Deming, New Mexico. This invention provides a handle for use on saws and other tools, and is arranged to permit the operator conveniently to attach the handle to the tool in any position to suit the convenience of the user of the tool. As shown in the illustration,



TOOL HANDLE.

the saw is provided at the end with two handles alike in construction. Each of the handles proper contains a nut engaging a screw rod. The flattened end of the rod carries a lug adapted to engage an aperture in the saw. When the handle proper is turned the screw rod draws the saw up against a grooved bearing mounted on the end of the handle.

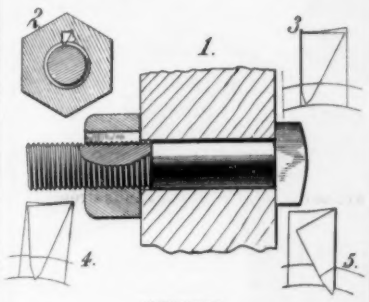
DRAWING INSTRUMENT.—J. W. WHALEN, Graymont, Ill. This instrument permits measuring in degrees an arc of a circle of unknown dimension and whose center is not located; insures accuracy in arc and angle measurements; measures line segments and radii and expresses their length in a certain exponent; finds the limits of each successive arc and center of its respective circle in any curve, so that any curve may be inked with a



DRAWING INSTRUMENT.

compass; analyzes any curve into measured arcs and radii for a complete record; uses such record for reproducing segments of curves or symmetrical curves of the same on enlarged or reduced scale; builds complex and compound curves and figures of straight lines and curves; forms designs composed of similar curves of varying sizes; expresses the exponents of the algebraic expression (ab^n); and performs other measurements. The engraving shows a face view of the instrument.

NUT LOCK.—B. G. PATTERSON, 1136 W. 14th St., Oklahoma, Okla. In this invention a dog or locking device is arranged in a slot or recess in the nut and adapted when in a certain position to engage the thread of the bolt, and when in a reverse or opposite position, is out of engagement therewith. Fig. 1 shows an enlarged sectional view representing a nut and bolt and locking device applied as in use. Fig. 2 is a cross section of a bolt and nut showing the dog or locking device in a non-locking position. Figs. 3, 4 and 5 show

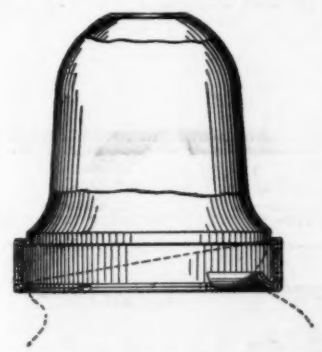


NUT-LOCK.

diagrammatically the different positions of the locking device which is in the form of a scalene triangle, one corner of the base being acute-angled and the other right-angled, and its biting edge is adapted to conform to the thread of the bolt. The bottom of the slot is formed to describe an obtuse angle, the apex of the angle constituting a fulcrum for the dog on which the latter is adapted to rock in assuming different positions. On one side the slot is much deeper than the other, and the inner acute angle of the dog enters this part when the dog is engaged with the thread.

Heating and Lighting.

SHADE HOLDER.—HENRY GOODFRIEND, address 124 N. Jefferson St., Chicago, Ill. In this patent No. 1,039,519 the invention relates to shade holders for incandescent and other lamps, and the construction enables the shade to be readily and easily attached in position with reference to the lamp globe or bulb, and as readily removed therefrom in case of damage or whenever removal is necessary. The improvement securely engages and releases a shade by simply turning a ring; there



SHADE HOLDER FOR INCANDESCENT AND OTHER LAMPS.

are no springs, wires, clamps, screws or any parts that can get out of order; it does away with the unsightly appearance of screws which are often lost in handling; it prevents breakage of glass by allowing for expansion by heat; it can be stamped out of sheet metal at small cost in any size and shape and in a large variety of designs; and it may be used on gas as well as on electric fixtures in upright or in vertical position. A side elevation of the shade-holder partly in section is shown herewith.

Household Utilities.

CLOTHES LINE HANGER.—L. KALMANOVITS, 629 Tinton Ave., Bronx, N. Y., N. Y. This device comprises a pair of spaced plates, a roller journaled between the same and adapted to have a line pass around it, and a guide movably mounted relative to the plates, and adapted to engage clothes pins or other projections or objects on the line, and to guide

CLOTHES LINE HANGER.

and maintain them in normal positions as they pass partly around the hanger, whereby the line is supported at the clothes pins by the guides. The plan view shows clothes line hangers in use for supporting an endless clothes line.

Machines and Mechanical Devices.

RIFLE TRYING DEVICE.—J. LIVTSCHAK, St. Petersburg, Russia. The invention relates to improvements in this inventor's former device, whereby the present device is simplified. The rifle is permitted to move in the direction of the recoil, after which it can be returned by hand to the initial position. The fire arm is held truly square in initial position by providing on the front supports two parts, of which one above the barrel and gunstock is provided with a notch for the bed of backsight on the barrel and the other part beneath the rifle guides a champing ring on the rifle.

MULTIPLE LOOM.—G. GRATREAU, Paris, France. This invention relates to five improvements in multiple looms, whereby numerous drawbacks in other looms are avoided, so that the simultaneous weaving of two or several pieces of fabric is rendered easy and safe, while the examination of the lower pieces of fabric during the work is rendered possible.

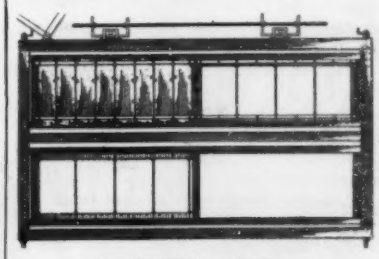
MACHINE FOR CASTING AND COMPOSING TYPE.—F. SCHIMMEL, 103 Rue du Sergent Blandan, Nancy, Meurthe-et-Moselle, France. This invention refers to an arrangement of matrices for casting and composing separate types, adapted to be applied to all kinds of machines for casting and composing type one by one, and adapted to permit a mixed composition of type of different fonts or characters, requiring, as in linotype machines, a large number of matrices for each font or character.

BENDING MACHINE.—F. T. ROOT, care of Defiance Machine Works, York, Pa. The object here is to provide a machine arranged to automatically impart a gradual traveling motion to the head blocks during the bending operation to compensate for the increase in length of the timber incident to the bending thereof, thus allowing the timber to hug the form very snugly and thereby insuring the formation of accurately bent timber.

PACKING MACHINE.—G. H. CAUGHRAN, Ketchikan, Alaska. This device is particularly useful in packing canned goods into cases preparatory to shipment. An object of the inventor is to provide machinery for automatically filling the cases with cans, thereby economizing in time in an operation which is generally performed by hand. The cans are automatically deposited in layers, and the case containing the cans discharged when the case becomes filled.

SIPHON FILTER.—J. A. CASE, Salida, Colo. Mr. Case's improvement is in siphon filters and has for its object the provision of a mechanism especially designed to thoroughly filter liquids, while at the same time facilitating the withdrawal of the liquid from the receptacle.

EMBROIDERY MACHINE.—E. FRIEDMAN, 2838 Fulton St., Brooklyn, N. Y. The invention relates to hand or power embroidery machines having a fabric-carrying frame adapted to be shifted according to the design of a pattern plate for the needles and thread to produce the desired embroidery on a piece of fabric. The machine secures accurate alinement and stretching of fabric material in individual frames, and exposes only the surface portion of the fabric material to be embroidered, thus permitting the accommodation of a large number of single frames on one machine at a time, thereby increasing the output of the machine. The engraving shows a front elevation of a series of fabric frames mounted on the main frame of the embroidery machine.



EMBROIDERY MACHINE.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

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(*Concluded from page 441.*)

by a permanent handsome structure of iron and steel which will occupy three years in erection. The river here is nearly a mile wide in flood time and the current runs very strong.

It is ultimately intended that Alexandretta, near the extreme northeast corner of that part of the Mediterranean, shall be the Syrian port of the Bagdad railroad and a pier has already been constructed here. It is proposed to run the rails from this port to Osmaniyeh on the main line. The merchants at Aleppo, however, are endeavoring to induce the Germans to run the line from Alexandretta direct to Aleppo. The Germans were to have built a harbor at Alexandretta and collected a large quantity of material here for this purpose. They have now suddenly ceased, so far as the harbor is concerned. Locally, different reasons are given. Some declare it is for the want of funds, which is not to be credited, for money is being used almost profusely on the main lines. Others say it is because Great Britain has interfered, which is the more probable. No doubt she objects to the Germans establishing themselves on the Mediterranean, and in any case the harbor bids fair to hang fire until a satisfactory understanding with England is arrived at. Alexandretta, too, is in a marshy locality and suffers from fever, and extensive sanitation is called for to make the place healthy. Just south of Osmaniyeh rise the Amanus mountains and here an army of men have commenced the boring of a six-mile tunnel. The whole of the material in the way of rails, sleepers, stone and iron work for the bridges, lumber for the stations, locomotives and rolling stock is supplied by German manufacturers. This is one of the conditions of the concession and is rigidly enforced by the contractors. Thousands of cars for passengers and freight are now being built in the Fatherland. The passenger cars are to be of the finest kind and include sleeping and dining saloons. All private supplies, too, for the engineers come from Germany. Naturally, the principal engineers are Germans, though thousands of Turks are found among the ranks of the laborers.

Taking the route from Scutari to Aleppo the present gaps do not amount to more than a hundred miles. Yet it is doubtful if a through communication will be possible for another couple of years or more. It all depends upon the success of the engineers in the Taurus Mountains. When the connection is at last made the Bagdad Railroad will at once jump into popular prominence as affording direct railroad communication between Europe and the sacred cities of Palestine as well as with the Euphrates. This will be rendered possible because the Turkish Government has already advanced the lines from Damascus to Aleppo. Then from Damascus, railroad connection may be had with Nazareth and Haifa, and as it is intended to connect Jerusalem with this system the Holy City will also be in railroad touch with Damascus and also with Aleppo in the far north. This will mean that one will be able to journey by rail from the great centers of Europe to Constantinople and then across by ferry to the other side, and on by train to the cities of Palestine. Ultimately, however, it is expected that a bridge will be thrown across the Bosphorous, connecting the Bagdad line with those of Constantinople, thus giving a through communication with the vast railroad systems of Europe.

Indeed, this linking up of Syria and Mesopotamia, with its ancient sacred cities, with Europe by rail, is one of the most interesting features of this great undertaking. Mosul, on the Tigris, is a flourishing little village that has sprung up upon the ruins of ancient Nineveh, and is expected to be reached early in 1914, if not before. From here the railroad will follow the west bank of the Tigris to Bagdad. The stretch of country lying between the rivers Euphrates and Tigris is said to mark the site of the Garden of Eden. This is now to be irrigated by English engineers, and as the soil is exceedingly rich and only needs watering, is expected to become a great grain-producing country. To-day it is desert

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All communications are strictly confidential. Our vast practice, extending over a period of more than sixty years, enables us in many cases to advise in regard to patentability without any expense to the client. Our Hand Book on Patents is sent free on request. This explains our methods, terms, etc., in regard to PATENTS, TRADE MARKS, FOREIGN PATENTS, etc.

All patents secured through us are described without cost to the patentee in the SCIENTIFIC AMERICAN.

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Advertising in this column is 75 cents a line. No less than four nor more than 12 lines accepted. Count seven words to the line. All orders must be accompanied by a remittance.

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AGENTS—Ask us about our snappy household specialty line that will clear you $50 to $80 weekly. American Aluminum Co., Division 1029, Lemont, Ills.

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FOR SALE. United States Patent No. 1,039,772 Oct. 1st, 1912, also Great Britain, France, Italy, Belgium and Canada Patents (others pending). The Hawkins-Masters, Anti-Skid, shock-absorber and Anti-friction Wheel Patent, simplicity. Manufacturers and others interested who have wrote before, write again, also others write to Albert Victor Masters, 52 Bramah Rd., Brixton, London, S. W., England.

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POST CARDS of Irish Scenery, Irish Antiquities, etc. Famous Liners—White Star, Cunard, etc., Lighthouses—Home and Foreign. Our catalogue and sample post card sent to any address for five cents in stamps. The Lighthouse Literature Mission, Department 1 S.A., Belfast, Ireland.

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WANTED: One assistant master steelmaker at $5.04 per diem. A competitive examination will be held at the Navy Yard, Brooklyn, N. Y., December 5, 1912, for the purpose of filling the above position. For further information address Commandant, Navy Yard, Brooklyn, N. Y.

WANTED: One laboratorian at $4.00 per diem. A competitive examination will be held at the Navy Yard, Brooklyn, N. Y., November 25, 1912, for the purpose of filling the above position. For further information address Commandant, Navy Yard, Brooklyn, N. Y.

WANTED—General Agent for State of New York to sell a portable device for overcoming dead centers, or will sell patent right. Full information. Patent applied for. Address Wm. H. Walker, Dover, Delaware.

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MODEL AND FINE CLOCK TRAIN WORK. Estimates given. Work done by the hour or by contract. Waltham Clock Company, Waltham, Massachusetts.

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Inquiry No. 9287. Wanted to buy a machine which will reduce cobs to meal—not a machine for shredding the cobs, but a machine that will pulverize them.

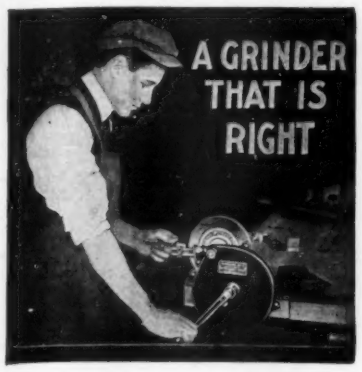
Inquiry No. 9288. Wanted the names and addresses of concerns that can coat steel balls with pure tin one-sixteenth of an inch thick.

Inquiry No. 9289. Wanted substance melting at 225° and hardening when cold without imparting any flavor to tobacco smoke and without emitting any oily or fatty vapor.

Inquiry No. 9290. Wanted name and address of a manufacturer of a patented device which is suitable for making up pay envelopes, namely, to fold up bills and insert them with minor coins in a pay envelope of the usual size.

Inquiry No. 9291. Want to buy machinery for manufacturing wooden tooth picks.

Inquiry No. 9293. Wanted the names and addresses of manufacturers of waterproof cloth, also samples of such cloth.



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EDITION OF 1913

It contains 608 pages and 1000 illustrations, is substantially bound in cloth and the cover carries a special design printed in three colors.

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A. Russell Bond
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and only sparsely inhabited, but in ancient times it was fertile and thickly populated, the seat of an empire that swayed the East. Not far from Bagdad lie the ruins of ancient Babylon, that mighty city reared by Nebuchadnezzar, and it is expected that many will travel over the railroad to visit them. Thus will the Bagdad line bring those old Bible cities of Mesopotamia into close communication with Europe as well as the sacred cities of Palestine. Then, when the Gulf is reached, it is but a hand's throw, as distances go, across Persia to India, and it is surely not too much too expect that the Bagdad enterprise, despite all the anxieties it has caused to European statesmen, will eventually result in the carrying of the steel rails into that Empire.

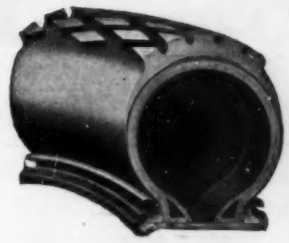
Some Remarkable Specimens of Ancient Glass

THE remains of an ancient glass works of the Roman period which the French archæologist M. Bauget discovered near St. Menehould showed many specimens of glass and colored enamels, and from these M. Franchet was able to draw some interesting conclusions. He discusses the two general classes of transparent glass and enamels. Many specimens of glass cut into cubes for use as mosaics were found here. As regards the glass, this had about ten different tints, and the colors were obtained mainly with iron oxide for the greens, cobalt oxide for the blues and oxide of manganese for the violet shades. A thin layer of *hematinon* which is a copper red glass is also applied upon clear glass as at the present day. Such glass was used mainly for vessels and bottles, but some very flat glass plates were also found. Most remarkable are the enamels used for mosaics, and in spite of the lack of means which modern industry gives, the Romans were able to produce series of color shades for the enamels which are most varied. M. Franchet recognized thirteen main colors, giving an *ensemble* of ninety-eight tones, and the number certainly did not end here. Such enamels he considers as very fine specimens of industry, and he mentions the series of *hematinon* reds, obtained by reducing copper oxide by means of iron protoxide. The antimony yellow enamels, the turquoises which are the most striking of all and are obtained by copper oxide dissolved in an alkaline silicate, the series of greens obtained by mixing the turquoise blue with antimony yellow, were also remarked. The gradation of tones in the same color series gives a perfect regularity and shows great skill in this art. He considers that the technique of these enamels is clearly of Egyptian origin, and that the products closely resemble those which are found in Egypt belonging to the Saïte epoch. But these processes appear to have been known in Persia much farther back. The Gallo-Roman products are enamels in the strict sense of the word, and he made experiments in order to coat them upon pottery of the same period, being successful in doing this. It is therefore a matter of surprise that the Romans who showed such great skill in producing enamels, never used these for decorating pottery.

Return of the Swiss Trans-Greenland Expedition

DR. ALFRED DE QUERVAIN and his party of six, who left Disko Island, on the west coast of Greenland, with 29 dogs and 3 sledges on June 10th, succeeded in crossing the inland ice and arrived at Angmagsalik, on the east coast, August 1st, whence they returned to Copenhagen October 12th. Their route was farther north and longer than that followed by Nansen, who made the only previous crossing of Greenland in 1888, but much shorter than that to be followed by Koch's expedition, which is now marching westward from Cape Bismarck. Dr. de Quervain's party report crossing a vast inland lake, covered with thin ice. Near the east coast they discovered and surveyed a large mountainous district, which they named Switzerland. Its highest summit, 9,000 feet high, was christened Mount Forel.

No-Rim-Cut Tires 10% Oversize



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The usual projections are too short-lived. So we made a thick, extra tread of very tough rubber and vulcanized it onto the regular. That means a double-thick tread.

Thus the blocks are deep-cut and immensely enduring. They last for thousands of miles.

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We present to the road surface countless edges and angles. In every direction, under every condition, they hold with a bulldog grip.

The usual projections carry the strain to only a part of the tire surface. Thus the fabric is easily wrecked.

These blocks of ours widen out at the base. They distribute the strain exactly the same as with smooth-tread tires.

200,000 of these treads in use prove that nothing has ever solved the skidding problem like this Goodyear Non-Skid. You can see at a glance that we've done it.

230,000 Cars Last Year

Last year's output of Goodyear tires was enough to equip 230,000 cars.

The best other tire made has never approached this wondrous popularity.

Yet the demand is doubling over and over, faster than we can build factories.

For we ended rim-cutting with our patent No-Rim-Cut tires and we added one-fourth to the average tire mileage by making them 10 per cent oversize.

Men are now coming to this type of tire in a way that is breaking all records of Tiredom. For your own sake, make a comparison.

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With or Without Non-Skid Treads

The Goodyear Tire Book — our 14th edition — tells a hundred things you should know. Ask us to mail it to you.

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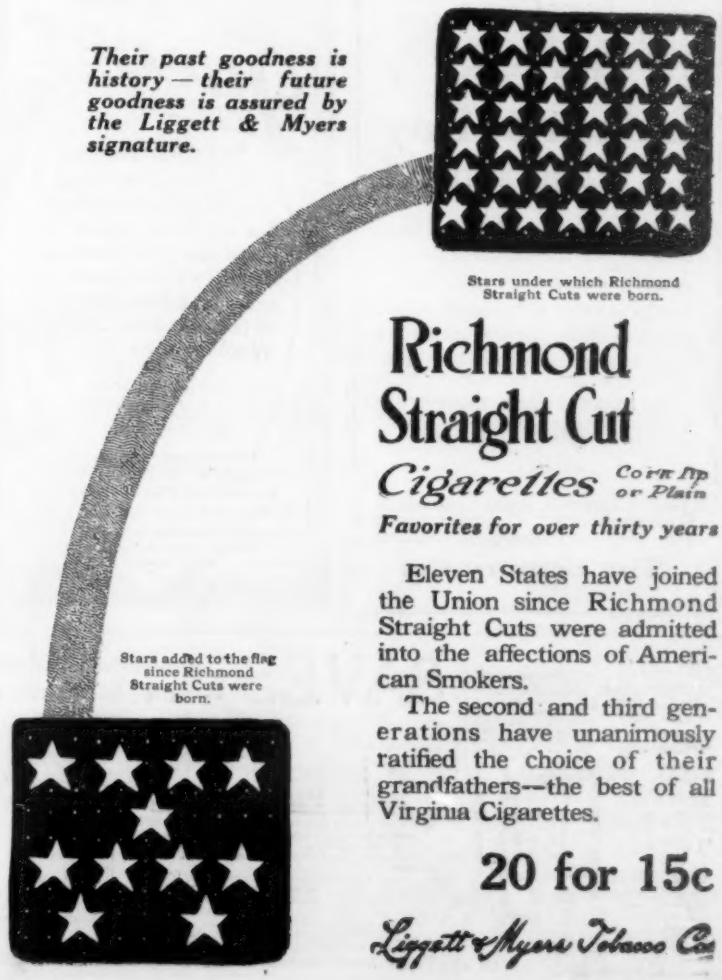
Their past goodness is history — their future goodness is assured by the Liggett & Myers signature.



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This "YANKEE" RATCHET BREAST DRILL

can be worked in places and under conditions where it is impossible to operate any other drill or boring machine. The "YANKEE" improvements adapt the tool to the working requirements of any job.

Five Adjustments —Right, Left and Double Ratchet movements; Plain Drill; and gears locked.

Breast Plate can be turned.

Two Speeds. Changed at a touch of this little lever, at any point in revolution without removing drill from work

Two-Jaw Chuck for round or square shanks. Jaws are accurate; securely hold drills, bits and other tools—centered absolutely. Made also with three-jaw chucks (for round shank tools only).

This Handle has bit for use as a screw-driver for the tool.

This Shifter Controls the Adjustments

First-notch—Plain Drill; *Second-notch*—Left-hand Ratchet; *Third-notch*—Right-hand Ratchet; *Fourth-notch*—DOUBLE RATCHET; *Fifth-notch*—gears locked. Changes made at a finger touch. THE DOUBLE RATCHET is a big time-saver and convenience in close quarters: Every movement of the crank, forward and back, causes the drill to *cut continuously.*

"YANKEE" Breast Drill: Price $5.25 Length, 17 inches. Weight, 6½ lbs. No. 555—Two-jaw chuck. No. 1555—Three-jaw chuck. Both double speed. Your dealer can supply you. *Write for "YANKEE" Tool Book."*

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DESCRIPTION: Rigid steel frame, absolutely indestructible, ample space for full week's supply of stationery. Wood platforms—silent under operation. Easily moved when on casters, half turn of lever makes it rigid and immovable. Sides fold up, and steel top rolls down and locks.

Write us on your business stationery for our 15 day trial offer. We fill orders through our dealer or through yours if we have none, providing you will give us his name. If not satisfactory after *15 days' free trial our dealer will buy it back at the full price.*

OFFICE SUPPLY DEALERS who will handle the line, write us for a special proposition.

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Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12701) W. A. B. asks: It is known that the waters of the ocean contain about three per cent of minerals in solution, about three fourths of which is common salt. Will you please state in your Queries and Answers column what are the percentages of the other minerals held in solution, as far as known? A. The water of the ocean and of salt seas does not have a definite proportion of the various salts in it, nor the same proportion in all parts of the ocean and the seas. For this reason no exact statement of quantities is possible. Indeed, the salts present are not the same for all sea water. The Encyclopædia Britannica gives a table based upon the assumption of 35 parts of solid salts in 1,000 parts of sea water. This table shows:

	Parts.
Sodium chloride	27.213
Magnesium chloride	3.807
Magnesium sulphate	1.658
Calcium sulphate	1.260
Potassium sulphate	0.863
Calcium carbonate	0.123
Magnesium bromide	0.076

(12702) A. H. B. says: My friend and I have had a long discussion upon the question of the exact difference between "art," "science," and "scientific." My friend claims that there is a difference in the meaning of the words "art" and "science." I claim that science is applied art. A. The words "art" and "science" have distinct meanings, and yet relative meanings. The science of navigation comprises the rules and theory by which a ship is directed from one port to another. This a man can learn who has never seen a ship. It is largely mathematical, and is taught in colleges far from the seaboard. The art of navigation consists in actually being able to direct the ship across the waters to its destined port. A man may know the art of navigation with very little knowledge of the science or theory of navigation. Many a captain of a small coasting vessel can work his latitude and longitude with no knowledge whatever of the reasons why he takes certain numbers from the tables and does certain things with the numbers. These illustrations will help to the understanding of the use of these words. An art implies the *skill* or ability to do something. The word "art" means "skill." A science is the body of knowledge upon a certain subject; the word "science" means knowledge. Botany is the science of the laws of plant life. Carpentry is an art. Ship-building is an art; the principles of ship-building are a science. The word "scientific" means pertaining to science. A scientific man is one who is occupied with a science, or spends his time in work connected with science. Art is applied science, and not, as you say, science is applied art.

(12703) N. J. L. asks how to make carbon Rods and Plates. A. Carbon rods and plates of the finest quality can be made economically only by the use of expensive machinery and apparatus, such as pulverizing mills, hydraulic presses, and retorts or ovens; but the amateur, without a great deal of trouble, and with very little expense, can make carbon plates and rods which will answer a good purpose. The materials required are wheat, coke, flour, molasses or syrup, and water. The tools consist of a few molds, a trowel or its equivalent, for forcing the carbon mixture into flat molds, tubes to be used as molds for carbon rods, and ramrods for condensing the material in the tubes and forcing it out, and an iron mortar, or some other device, for reducing the coke to powder. Clean pieces of coke should be selected for this purpose, and such as contain no volatile matters are preferred. The coke is pulverized and passed through a fine sieve. It is then thoroughly mixed with one sixth to one eighth its bulk of wheat flour, both being in a dry state. The mixture is moistened with water (or water with a small percentage of molasses added) sufficiently to render it thoroughly damp throughout, but not wet. It should now be allowed to stand for 2 or 3 hours in a closed vessel, to prevent the evaporation of the water. At the end of this time the mixture may be pressed into molds of any desired form, then removed from the molds, and dried, slowly at first, afterward rapidly, in an ordinary oven, at a high temperature. When the plates or rods thus formed are thoroughly dried they are packed in an iron box, or, if they are small, in a crucible, and completely surrounded by coke dust to exclude air and to prevent the combustion of the plates or rods during the carbonizing process. The box or crucible must be closed by a non-combustible cover, and placed in a furnace or range fire in such a way as to cause it to be heated gradually to a red heat. After the box becomes heated to the required degree, it is maintained at that temperature for an hour or so, after which it is removed from the fire and allowed to cool before being opened. The rods or plates are then boiled for half an hour in this syrup, or in molasses diluted with a little water. They are again baked in an ordinary oven, and afterward carbonized in the manner already described. This latter process of boiling in syrup and recarbon-

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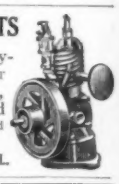

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Our catalog contains many other styles and sizes of tables, at prices from $15 up, on terms of $1 or more down and a small amount each month. Write for the catalog, or order directly from this advertisement.

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On receipt of first installment we will ship Table. Play on it one week. If unsatisfactory return it, and on its receipt we will refund your deposit. This ensures you a free trial. Write today for illustrated catalog giving prices, terms, etc.

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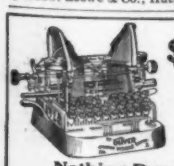

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izing is repeated until the required density is secured. As some gases are given off during carbonization, it is necessary to leave the box or crucible unsealed to allow these gases to escape.

(12704) R. C. W. asks how to work and treat meerschaum pipes.—1. Meerschaum is worked in the following way: The large pieces of meerschaum are cut with a band saw to a convenient size, after which the material is soaked in water until it becomes quite soft. When wet it becomes very soapy, and will produce quite a lather if rubbed. After being thoroughly soaked, the meerschaum can be cut like cheese, and it is then roughly shaped with a knife to the form of a pipe. When dry, the bowl and stem shanks are drilled, and then if the pipe is of a plain pattern, it is turned on a lathe to the desired form. If a square stem shank is desired, it is shaped with a file. The shank is now shouldered and threaded to receive the amber stem piece. 2. Cleaning.—A very simple and effective way of cleaning the inside of a pipe is to plug up the bowl with a cork in which a hole has been bored. Fit the cork against the water tap and turn on the water. To clean the outside of the pipe, make a thick paste of whiting and turpentine, and brush it over with a hard brush. Leave the paste pretty thick on the pipe and allow it to become quite dry, when it should be brushed off with a clean hard brush. Finish cleaning the pipe by rubbing over with a soft cloth and sweet oil. 3. Discoloration, Removing.—To clean the carving on a meerschaum pipe and remove the black around the top, wash the bowl with hot milk, using a tooth or nail brush to clean the dirt out of the carved portion. For the black part try the effect of very fine pumice powder and benzoline; bring up the gloss again with putty powder and a trace of olive oil. The greater part of the coloring of a meerschaum may be removed by steeping it for some time in moderately strong ammonia solution, 1 part of strong ammonia to 2 parts of water. 4. Imitation.—These are said to be prepared from a mixture of the artificially prepared silicates of magnesia, alumina, and lime, and sulphate of lime; these are mixed together in the state of pastes, dried at the ordinary temperature, cut into small blocks, and dried on a stove. The blocks are then turned in the lathe in a similar manner to real meerschaum. Imitation meerschaum pipes should not be varnished; the varnish will burn or crack when the pipes are smoked. They may be warmed and rubbed with a little white wax and then polished with a soft rag. The best way, however, is to polish them with a revolving wooden polishing wheel covered with leather or felt, using dry putty powder or whiting.

(12705) R. L. N. asks how to clean and prepare bones and ivory. A. 1. The curators of the anatomical museum of the Jardin des Plantes have found that the spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for 3 or 4 days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor, which sinks to the bottom, and strongly attacks the ivory if allowed to touch it. 2. Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean, dry, hard brush, adding one or two drops (not more) of alcohol. 3. Mix about a tablespoonful of oxalic acid in ½ pint of boiling water. Wet the ivory over first with water, then with a toothbrush apply the acid, doing one side at a time, and rinsing, and finally drying it in a cloth before the fire, but not too close.

(12706) T. M. N. asks for rosin for bows, violin. A. 1. For violin rosin, boil down Venice turpentine with a little water until a drop, cooled on a piece of glass, is of proper consistency. During the boiling, cold water must be added from time to time. When sufficiently thick, pour into cold water, knead well, and when cold break into pieces. Expose to sun until dry and transparent. 2. Select the best clear brown rosin, melt it in a clean basin, to merely a boil, which will clear it of turpentine or other volatile oils. Pour in paper molds.

(12707) J. C. asks: Some scientists claim that the universe began as a cold, nebular vapor, and acquired heat by contraction. How could the elements, as we know them, exist as vapor in the cold, since they are all vaporized by sufficient heat and solidified by cold? It is not more reasonable to suppose that the universe began in a state of intense heat and is now cooling off; or would the fact that space itself is intensely cold favor the cold nebula idea? What is the probable temperature outside our atmosphere? Can you advise some books that will give information on this subject? A. There are two hypothesis in reference to the condition of the matter of the universe at the moment when science begins its discussion of the formation of the worlds. Both these agree that the matter was in a nebulous condition. As Prof. Young says, "This does not assume that matter was created in a nebulous condition. As the egg may be taken as the starting point for the life history of the animal, so the nebula may be taken as the starting point for the life history of the planetary system." On one theory the nebula was in the form of a heated gas; on the other, it was a cloud of cold meteoric dust. This latter many astronomers think is more likely to be true. The probable temperature of outside space is at or very near absolute zero. A recent discussion of this subject is to be found in Young's "Manual of Astronomy," price $2.50; or in Moulton's "Introduction to Astronomy," price $1.80.

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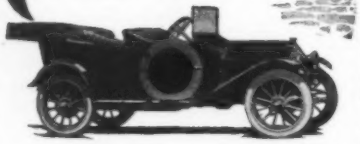

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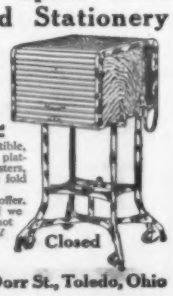

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(12701) W. A. B. asks: It is known that the waters of the ocean contain about three per cent of minerals in solution, about three fourths of which is common salt. Will you please state in your Queries and Answers column what are the percentages of the other minerals held in solution, as far as known? A. The water of the ocean and of salt seas does not have a definite proportion of the various salts in it, nor the same proportion in all parts of the ocean and the seas. For this reason no exact statement of quantities is possible. Indeed, the salts present are not the same for all sea water. The Encyclopædia Britannica gives a table based upon the assumption of 35 parts of solid salts in 1,000 parts of sea water. This table shows:

	Parts.
Sodium chloride	27.213
Magnesium chloride	3.807
Magnesium sulphate	1.658
Calcium sulphate	1.260
Potassium sulphate	0.863
Calcium carbonate	0.123
Magnesium bromide	0.076

(12702) A. H. B. says: My friend and I have had a long discussion upon the question of the exact difference between "art," "science," and "scientific." My friend claims that there is a difference in the meaning of the words "art" and "science." I claim that science is applied art. A. The words "art" and "science" have distinct meanings, and yet relative meanings. The science of navigation comprises the rules and theory by which a ship is directed from one port to another. This a man can learn who has never seen a ship. It is largely mathematical, and is taught in colleges far from the seaboard. The art of navigation consists in actually being able to direct the ship across the waters to its destined port. A man may know the art of navigation with very little knowledge of the science or theory of navigation. Many a captain of a small coasting vessel can work his latitude and longitude with no knowledge whatever of the reasons why he takes certain numbers from the tables and does certain things with the numbers. These illustrations will help to the understanding of the use of these words. An art implies the *skill* or ability to do something. The word "art" means "skill." A science is the body of knowledge upon a certain subject; the word "science" means knowledge. Botany is the science of the laws of plant life. Carpentry is an art. Ship-building is an art; the principles of ship-building are a science. The word "scientific" means pertaining to science. A scientific man is one who is occupied with a science, or spends his time in work connected with science. Art is applied science, and not, as you say, science is applied art.

(12703) N. J. L. asks how to make carbon Rods and Plates. A. Carbon rods and plates of the finest quality can be made economically only by the use of expensive machinery and apparatus, such as pulverizing mills, hydraulic presses, and retorts or ovens; but the amateur, without a great deal of trouble, and with very little expense, can make carbon plates and rods which will answer a good purpose. The materials required are wheat, coke, flour, molasses or syrup, and water. The tools consist of a few molds, a trowel or its equivalent, for forcing the carbon mixture into flat molds, tubes to be used as molds for carbon rods, and ramrods for condensing the material in the tubes and forcing it out, and an iron mortar, or some other device, for reducing the coke to powder. Clean pieces of coke should be selected for this purpose, and such as contain no volatile matters are preferred. The coke is pulverized and passed through a fine sieve. It is then thoroughly mixed with one sixth to one eighth its bulk of wheat flour, both being in a dry state. The mixture is moistened with water (or water with a small percentage of molasses added) sufficiently to render it thoroughly damp throughout, but not wet. It should now be allowed to stand for 2 or 3 hours in a closed vessel, to prevent the evaporation of the water. At the end of this time the mixture may be pressed into molds of any desired form, then removed from the molds, and dried, slowly at first, afterward rapidly, in an ordinary oven, at a high temperature. When the plates or rods thus formed are thoroughly dried they are packed in an iron box, or, if they are small, in a crucible, and completely surrounded by coke dust to exclude air and to prevent the combustion of the plates or rods during the carbonizing process. The box or crucible must be closed by a non-combustible cover, and placed in a furnace or range fire in such a way as to cause it to be heated gradually to a red heat. After the box becomes heated to the required degree, it is maintained at that temperature for an hour or so, after which it is removed from the fire and allowed to cool before being opened. The rods or plates are then boiled for half an hour in this syrup, or in molasses diluted with a little water. They are again baked in an ordinary oven, and afterward carbonized in the manner already described. This latter process of boiling in syrup and recarbon-

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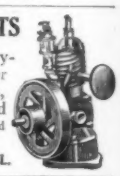

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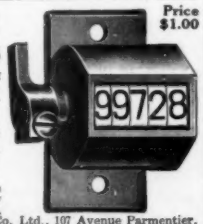

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izing is repeated until the required density is secured. As some gases are given off during carbonization, it is necessary to leave the box or crucible unsealed to allow these gases to escape.

(12704) R. C. W. asks how to work and treat meerschaum pipes.—1. Meerschaum is worked in the following way: The large pieces of meerschaum are cut with a band saw to a convenient size, after which the material is soaked in water until it becomes quite soft. When wet it becomes very soapy, and will produce quite a lather if rubbed. After being thoroughly soaked, the meerschaum can be cut like cheese, and it is then roughly shaped with a knife to the form of a pipe. When dry, the bowl and stem shanks are drilled, and then if the pipe is of a plain pattern, it is turned on a lathe to the desired form. If a square stem shank is desired, it is shaped with a file. The shank is now shouldered and threaded to receive the amber stem piece. 2. Cleaning.—A very simple and effective way of cleaning the inside of a pipe is to plug up the bowl with a cork in which a hole has been bored. Fit the cork against the water tap and turn on the water. To clean the outside of the pipe, make a thick paste of whiting and turpentine, and brush it over with a hard brush. Leave the paste pretty thick on the pipe and allow it to become quite dry, when it should be brushed off with a clean hard brush. Finish cleaning the pipe by rubbing over with a soft cloth and sweet oil. 3. Discoloration, Removing.—To clean the carving on a meerschaum pipe and remove the black around the top, wash the bowl with hot milk, using a tooth or nail brush to clean the dirt out of the carved portion. For the black part try the effect of very fine pumice powder and benzoline; bring up the gloss again with putty powder and a trace of olive oil. The greater part of the coloring of a meerschaum may be removed by steeping it for some time in moderately strong ammonia solution, 1 part of strong ammonia to 2 parts of water. 4. Imitation.—These are said to be prepared from a mixture of the artificially prepared silicates of magnesia, alumina, and lime, and sulphate of lime; these are mixed together in the state of pastes, dried at the ordinary temperature, cut into small blocks, and dried on a stove. The blocks are then turned in the lathe in a similar manner to real meerschaum. Imitation meerschaum pipes should not be varnished; the varnish will burn or crack when the pipes are smoked. They may be warmed and rubbed with a little white wax and then polished with a soft rag. The best way, however, is to polish them with a revolving wooden polishing wheel covered with leather or felt, using dry putty powder or whiting.

(12705) R. L. N. asks how to clean and prepare bones and ivory. A. 1. The curators of the anatomical museum of the Jardin des Plantes have found that the spirits of turpentine is very efficacious in removing the disagreeable odor and fatty emanations of bones or ivory, while it leaves them beautifully bleached. The articles should be exposed in the fluid for 3 or 4 days in the sun, or a little longer if in the shade. They should rest upon strips of zinc, so as to be a fraction of an inch above the bottom of the glass vessel employed. The turpentine acts as an oxidizing agent, and the product of the combustion is an acid liquor, which sinks to the bottom, and strongly attacks the ivory if allowed to touch it. 2. Make a thick paste of common whiting in a saucer. Brush well with a toothbrush into the carved work. Brush well out with plenty of clean water. Dry gently near the fire. Finish with a clean, dry, hard brush, adding one or two drops (not more) of alcohol. 3. Mix about a tablespoonful of oxalic acid in ½ pint of boiling water. Wet the ivory over first with water, then with a toothbrush apply the acid, doing one side at a time, and rinsing, and finally drying it in a cloth before the fire, but not too close.

(12706) T. M. N. asks for rosin for bows, violin. A. 1. For violin rosin, boil down Venice turpentine with a little water until a drop, cooled on a piece of glass, is of proper consistency. During the boiling, cold water must be added from time to time. When sufficiently thick, pour into cold water, knead well, and when cold break into pieces. Expose to sun until dry and transparent. 2. Select the best clear brown rosin, melt it in a clean basin, to merely a boil, which will clear it of turpentine or other volatile oils. Pour in paper molds.

(12707) J. C. asks: Some scientists claim that the universe began as a cold, nebular vapor, and acquired heat by contraction. How could the elements, as we know them, exist as vapor in the cold, since they are all vaporized by sufficient heat and solidified by cold? It is not more reasonable to suppose that the universe began in a state of intense heat and is now cooling off; or would the fact that space itself is intensely cold favor the cold nebula idea? What is the probable temperature outside our atmosphere? Can you advise some books that will give information on this subject? A. There are two hypothesis in reference to the condition of the matter of the universe at the moment when science begins its discussion of the formation of the worlds. Both these agree that the matter was in a nebulous condition. As Prof. Young says, "This does not assume that matter was created in a nebulous condition. As the egg may be taken as the starting point for the life history of the animal, so the nebula may be taken as the starting point for the life history of the planetary system." On one theory the nebula was in the form of a heated gas; on the other, it was a cloud of cold meteoric dust. This latter many astronomers think is more likely to be true. The probable temperature of outside space is at or very near absolute zero. A recent discussion of this subject is to be found in Young's "Manual of Astronomy," price $2.50; or in Moulton's "Introduction to Astronomy," price $1.80.

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FIRE PREVENTION. By Edward F. Croker, ex-chief of the Fire Department of New York city. New York: Dodd, Mead & Co., 1912. 8vo.; 354 pp.; illustrated. Price, 1.50 net.

In the United States, in the year 1907, building operations were carried on to the value of $1,000,000,000. In the same year the fire loss on buildings was $456,000,000. Thus nearly half as much property value was destroyed by fire as was created by the capital and industry of the nation. This constitutes a serious arraignment of our national habits, and it is high time that attention should be called to the necessity for greater and more intelligent precaution in home and business life. It would be hard to find a man better qualified to speak from the depths of knowledge and experience than Edward F. Croker, who was for twelve years chief of the most efficient fire department in the world. He begins at the beginning, with the individual and the home; the greater number of fires and a large percentage of the fire loss are chargable to the dwelling house. The author declares that out of twelve million buildings, probably eleven millions have been built "in entire disregard of the combustible nature of their materials." The shingle roof is particularly condemned as dangerous, and the false economy of such methods is pointed out. Among other precautions urged is the use of fire-retardant paints and whitewash. Dwelling-house equipment for the extinguishment of fires is thoroughly considered. Larger structures, for storage, manufacture, etc., next receive attention, and here again the matters of construction and equipment are clearly placed before the reader. Most interesting and instructive are the chapters on the fire department of the large city. The nature and the value of high-pressure water service, the modern fire-boat, and the law-making side of the problem each are dealt with in separate chapters. It is to be hoped that so authoritative a work may receive the attention it deserves, and that we may awaken to the criminal carelessness which alone makes possible so appalling a record.

THE RAILWAY LIBRARY. 1911. (Third Series.) Compiled and edited by Slason Thompson. Chicago: Bureau of Railway News and Statistics. 8vo.; 468 pp. Price, 50 cents.

Following the custom of past years, "The Railway Library" for 1911 is a collection of papers presenting various phases of the problem of transportation, these addresses and papers having been for the most part delivered or published during the year. These are by no means confined to bringing out points favorable to the roads, but deal impartially and from varying points of view with such subjects as the Interstate Commerce Commission, railway securities, Government ownership, efficiency of service, arbitration of disputes, the railway mail service, and French and British roads. A large portion of the work is devoted to statistics of American railways. The author is Director of the Bureau of Railway News and Statistics, and has succeeded in putting out a volume of the greatest interest to the student of railway conditions and problems.

THE SHERMAN ANTI-TRUST ACT AND THE PATENT LAW. The Supreme Court on Patents (the Dick Patent Case). By Gilbert H. Montague of the Bar of New York City. (Reprinted from the Yale *Law Journal*, April and May, 1912.) New Haven, Conn.: Press of S. Z. Field, 1912.

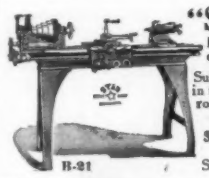
So much misinformation has been spread abroad on the subject of patent monopolies, that Mr. Montague has performed a useful service in here presenting the very vital difference between the monopolies which fall under the Sherman Anti-Trust Act and the monopolies that are granted to patentees of inventions. It is not generally realized that the Sherman Act is based upon an implication from that indefinite provision of the Constitution which authorized Congress "to regulate commerce with foreign nations and among the Federal States." Nor is it recognized that under the Constitution patentees are expressly given the exclusive right to their inventions within prescribed limits. The monopoly contemplated in the Sherman Anti-Trust Act may deprive the public of many privileges that it once enjoyed; the monopoly created by a patent takes nothing away from the public, but on the other hand gives it something that it never had before.

Mr. Montague takes up the subject of patents and trusts from the standpoint of the following three propositions:

First: The fact that the owner of a patent is a combination or a party to a combination, formed or existing for the purpose of monopolizing patents of the same general character, will not avail an infringer of such patent, who is not a licensee or party to such combination, as a defense to a suit for infringement, brought by the owner of such patent. Similarly, the fact that the owner of a patent is a combination or a party to a combination, formed or existing in violation of the Sherman Act, will not avail an infringer of such patent, who is not a licensee or party to such combination, as a defense to a suit for infringement brought by the owner of such patent.

Second: The owner of a patent may impose restrictions upon the use of the patent and the manufacture and sale of the patented articles by the licensee, and such restrictions, if part of that express agreement between the owner and such licensee, may be enforced by the owner against such licensee.

Third: The owner of a patent may impose restrictions upon the use and resale of the patented



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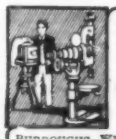

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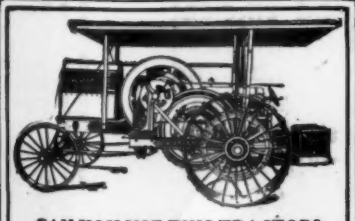

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article by the party to whom such article is sold, and such restrictions, if made known to such party, may be enforced against such party by the owner of the patent, even though no express agreement exists between them.

Mr. Montague shows that the first proposition of law seems well settled. The third proposition upon the present state of the authorities is also well established. The only modification seriously urged in respect to it would at most merely save from contributory infringement suits, parties who furnish general articles of commerce to the users of patented articles. Whatever bearing this possible modification may have on the third proposition, it appears upon analysis to throw little light on the relation of the Sherman Anti-Trust Act to the patent law. The second proposition of law upon the present state of the authorities is also well established. But in respect to this second proposition, and also the third proposition, the contention has been advanced in some quarters that the Sherman Anti-Trust Act forbids the owner of a patent to agree with another to restrain his own use of the patent and the manufacture and sale of the patented article.

Mr. Montague points out what we have ourselves dwelt upon editorially in the SCIENTIFIC AMERICAN, namely, that the Constitution provides that Congress shall have power "to promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." This constitutional guarantee of an exclusive privilege to the patentee flatly contradicts the prohibition of the Sherman Act, as Mr. Montague well insists. There is no reconciling the two. They are mutually inconsistent. One must yield to the other. Accordingly, it cannot be assumed that the Sherman Act intended to interfere with rights established by the Constitution and granted by the patent law.

RESEARCHES ON CELLULOSE. III. (1905-1910.) By C. F. Cross and E. J. Bevan. New York: Longmans, & Co., 1912. 8-vo.; 173 pp. Price, $2.50 net.

This is the third volume of a series issued by Cross and Bevan, the first covering the years 1895-1900, and the second 1900-1905. Since the publication of the second volume, additional technical institutions devoted wholly or mainly to this branch of chemical research have been organized. For example, England has a recently-founded Textile Institute devoting itself in large measure to this branch of industry. While in Germany, in 1905, a society calling itself "Verein der Papier & Zellstoff Chemiker" was started, and this has developed into an influential body that formulates problems for solution, and stimulates work upon these problems by a system of prizes. The published records of this society are very full, and the reader is referred to them for much information. The colloidal state introduces unusual complications, and calls for an accuracy in experiment that shall be little short of perfection. The constitution of cellulose is the subject of an early chapter, and the behavior of esters and autoxidation of ligno-celluloses are set forth in most interesting observations. Practical investigators will perhaps turn most eagerly to the chronicle of technical developments in Chapter V, where the most significant steps of recent progress receive discriminating attention.

PIGMIES AND PAPUANS. The Stone Age To-day in Dutch New Guinea. By A. F. R. Wollaston, with Appendices by W. R. Ogilvie-Grant, A. C. Haddon, F.R.S., and Sidney H. Ray. New York: Sturgis & Walton Company, 1912. 8vo.; 352 pp.; with illustrations and maps. Price, $4 net.

Mr. Wollaston's work is a circumstantial account of the expedition of the British Ornithologists' Union, the Royal Geographical Society also being represented. This expedition to the Snow Mountains encountered even more than the usual physical difficulties of an unexplored region, and, while it failed to penetrate these ranges to a greater height than some 4,000 feet, yet collections of great importance were made, and distinct contributions to science accomplished. The natives of New Guinea are most intimately described, with their arms, characteristics, and manner of living. These descriptions are augmented in interest and value by splendid illustrations in monochrome and in colors. Savage skill with the bow and arrow is somewhat discounted by the observations of the expedition, two Papuans failing to hit an iguana at twenty feet, although arrow after arrow was launched at the bulky creature. The Pigmies, or "Tapiro" were occasionally encountered, and at last were with much difficulty persuaded to escort the party to one of their villages. The Pigmies and the Papuans seem to be on terms of the utmost cordiality. The average height of forty adult males was found to be 4 feet 9 inches. In spite of all inducements, the women of the village were not produced, but were held secluded until the departure of the visitors.

SEASONAL TRADES. By Various Writers. With an Introduction by Sidney Webb. Edited by Sidney Webb, LL.B., and Arnold Freeman, M.A. London: Constable & Co., Ltd., 1912. 8vo.; 410 pp. Price, $3 net.

Included among the trades studied are the cycle industry, the gas industry, the London millinery trade, the building trade, the shoe trade, and the occupations of the tailor and the waiter. The investigations show long, patient and original work, and the volume is a welcome contribution to practical economics that, in England at least, should become a book of standard reference among those seeking to ameliorate the conditions of industrial life.

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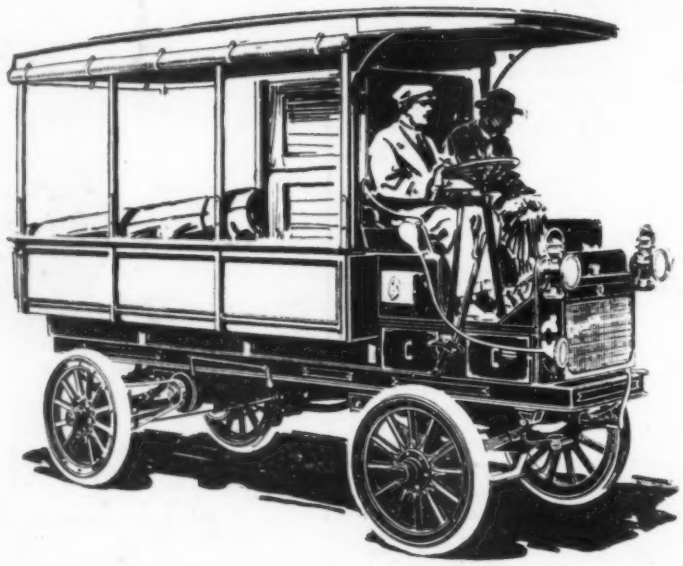

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